Historic, Archive Document

Do not assume content reflects current scientific knowledge, policies, or practices.

Reserve
aSF809
.B8N3

1969 proceedings

of the

U. S. DEPT. OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY
RECEIVED
SEP 13 1972
PROCUREMENT SECTION
CURRENT SERIAL RECORDS

NATIONAL BRUCELLOSIS COMMITTEE

and

progress report

of the

COOPERATIVE STATE-FEDERAL BRUCELLOSIS ERADICATION PROGRAM

Agricultural Research Service · U.S. Department of Agriculture

CONTENTS

The statements made by the participants are their own and do not necessarily represent the views of the U.S. Department of Agriculture.

Underscored numbers in parentheses refer to references at the end of each paper. References, figures, and tables are reproduced essentially as they were supplied by the author of each paper.

Mention of companies or commercial products does not imply recommendation or endorsement by the U.S. Department of Agriculture.

Issued July 1969

The meeting of the National Brucellosis Committee was held in conjunction with the annual meeting of Livestock Conservation, Inc., on February 26, 1969, at Sioux City, Iowa. The proceedings of this meeting are published jointly with the Progress Report of the cooperative State-Federal Brucellosis Eradication Program to consolidate information pertaining to the national brucellosis eradication effort.

OFFICERS OF THE NATIONAL BRUCELLOSIS COMMITTEE

The Nomination Committee (Forrest Lee, Chairman) recommended the following slate of officers, all of whom were elected unanimously:

Chairman: J. W. Ralph Bishop
Vice-chairman: J. B. Finley
Secretary: Paul Zillman
Assistant Secretary: H. S. Obenchain

Executive Committee

Alfred W. Keating	C. A. Manthei
J. W. Ralph Bishop	Marvin J. Tweihaus
W. D. Knox	J. H. Steele
J. B. Finley	Rolland Paul

Board of Directors

1969	1970	1971	1972
Paul Zillman	Alfred W. Keating	Mike Bay	J. Russell Ives
M. D. Mitchell	J. W. Ralph Bishop	S. H. McNutt	S. L. Hendrick
W. D. Knox	Harold C. King	Keith Meyers	H. G. Wixom
C. F. Neumann	James R. Hay	J. O. Pearce, Jr.	Charles Dancer
Lyle V. Springer	N. B. McCullough	Dan E. Flagg	Fred Black
Jean V. Smith	William Rothenberger	H. G. Wixom	E. A. Schilf
Leo Welder	Charles G. Scruggs	Bob Laramore	W. E. Smith
R. F. Sneddon	James H. Steele	Rolland Paul	Alfred W. Keating

1969 Proceedings of the National Brucellosis Committee and Progress Report of the Cooperative State-Federal Brucellosis Eradication Program

THE COOPERATIVE STATE-FEDERAL BRUCELLOSIS ERADICATION PROGRAM, A PROGRESS REPORT

By H. C. King[1]

The steady gains made during 1968 in eradicating brucellosis has reenforced our conviction that the goal of a Certified Brucellosis-Free Nation by 1975 can be reached. However, lest we become complacent, there are some soft spots--some weaknesses--that must be corrected. We must make more effective use of the proved tools of eradication, the market cattle testing (MCT) and the brucellosis ring testing programs, epidemiological methods and procedures. We must be more efficient in our use of the available resources to eradicate this disease.

All of the Modified Certified Brucellosis States are moving steadily toward a Certified Brucellosis-Free status. The addition of Maryland and New Jersey made a total of 14 States and the Virgin Islands that had reached a Certified Brucellosis-Free status. Two additional States, Colorado and Wyoming, became modified certified bringing the total of complete States that have reached this status to 42 plus Puerto Rico and the Virgin Islands (fig. 1).

As a result of these gains, at the end of the year there were only eight States that had not reached a Modified Certified Brucellosis status. One of these, Mississippi, has qualified since January 1, 1969.

Based on total counties that have reached a Modified Certified Brucellosis status, our progress looks reasonably good. Last year there was an increase of 84 counties that reached this status for a total of 2,995 at years end (fig. 2).

On a percentage basis, the 2,995 certified counties represent 95 percent of the 3,153 total counties in the United States, Puerto Rico, and the Virgin Islands (fig. 3). In 1954, when the accelerated program began, only 11 percent of the counties had reached this level. By 1966, this percentage had increased to 89 percent. Our rate of progress in qualifying the remaining 5 percent of the counties as modified areas must be increased if we are to reach our 1975 goal.

At the end of 1968, there were 1,198, or 38 percent of the total counties in the United States, Certified Brucellosis Free--a 27 percent increase over 1967 and a net gain of 256 counties (fig. 4). Although this represents a significant gain percentage wise, it is quite evident that a great deal of work still must be accomplished if the remaining 62 percent of the counties are to become Certified Brucellosis-Free in the next 7 years. There are still 158 counties in seven States in which sufficient work has not been completed to qualify for Modified Certified Brucellosis status, including 10 counties in two States in which area testing has not been started (fig. 5).

---

[1] Chief Staff Veterinarian, Brucellosis Eradication, Cattle Diseases, Animal Health Division, Agricultural Research Service, U.S. Department of Agriculture, Hyattsville, Md.

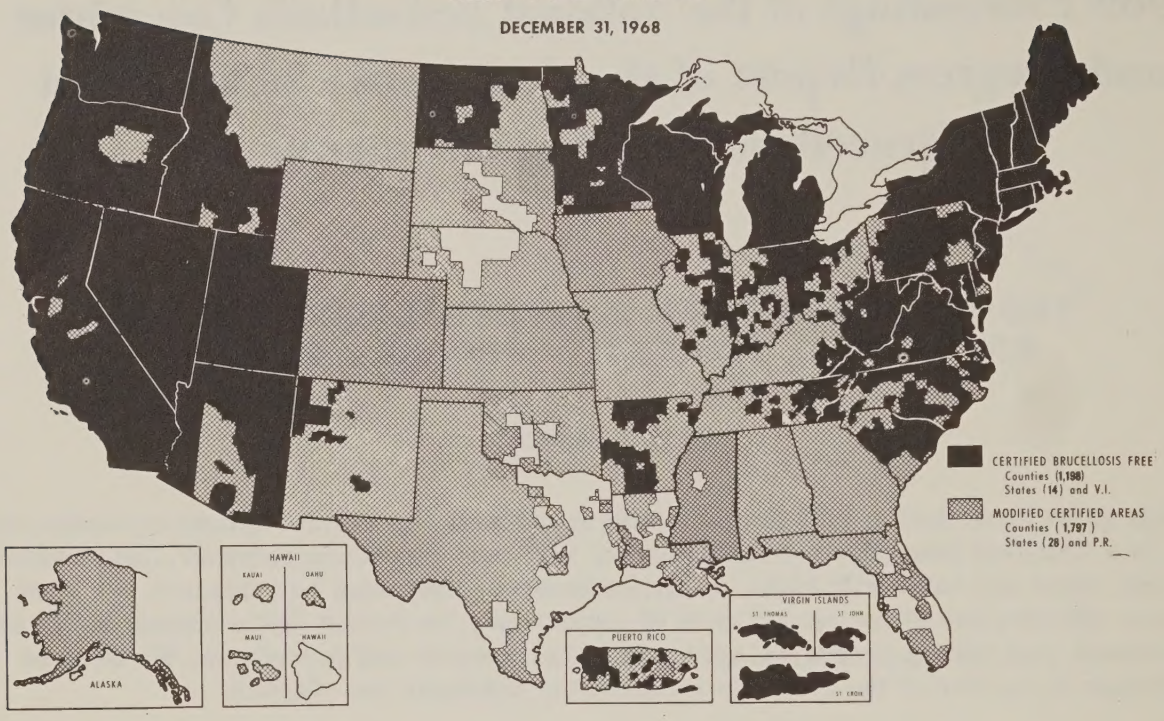


Figure 1.

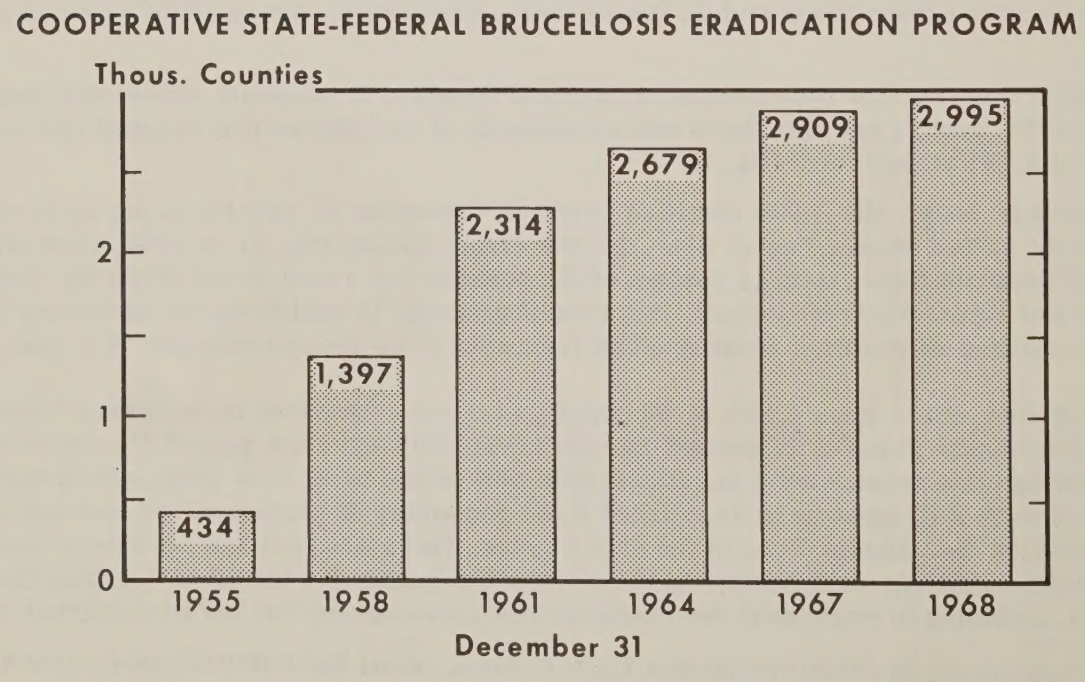


Figure 2.

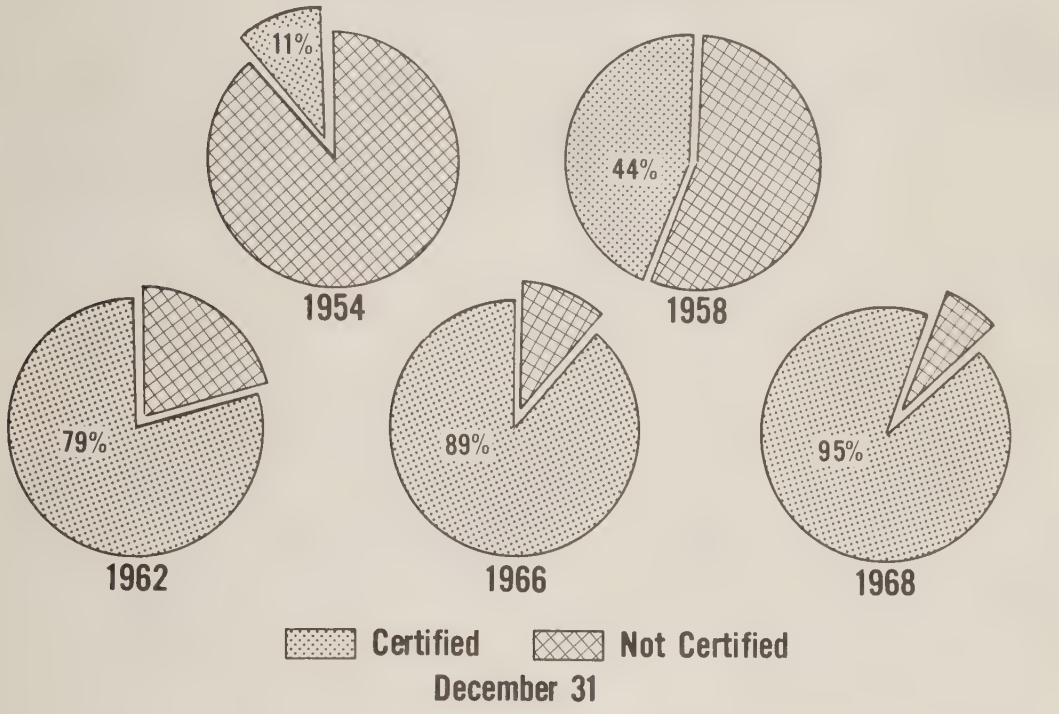


Figure 3.

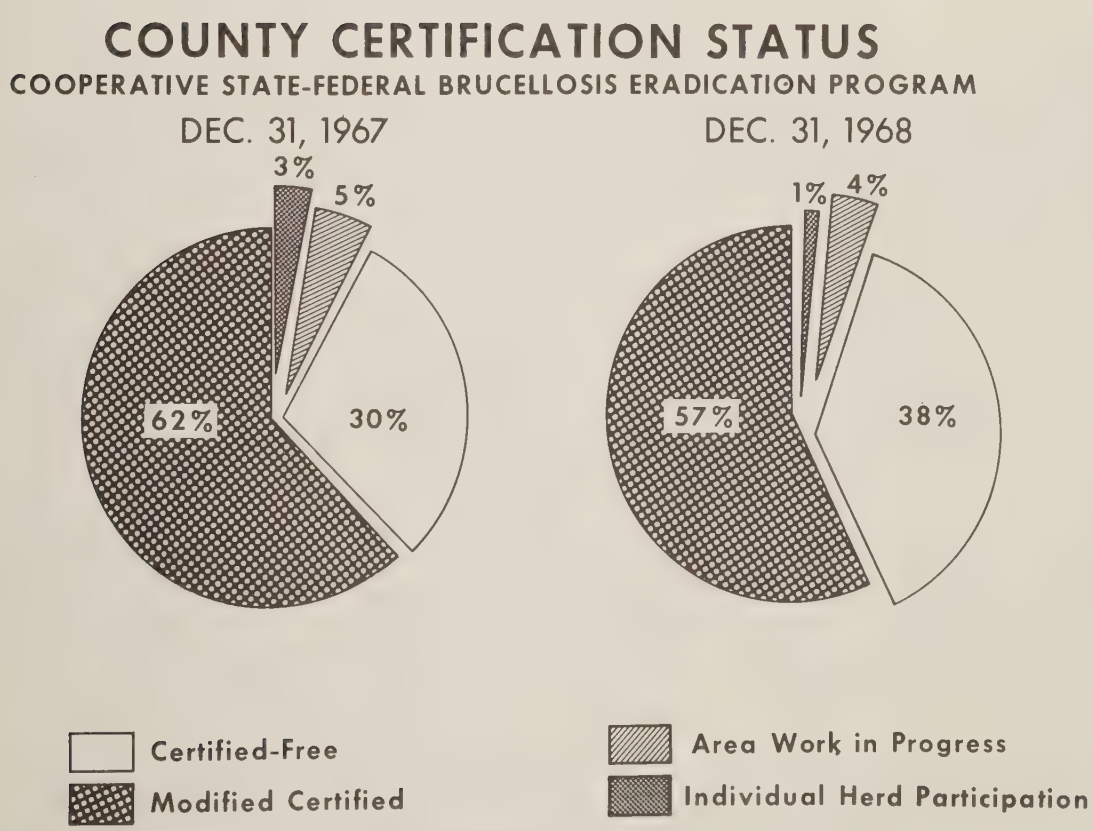


Figure 4.

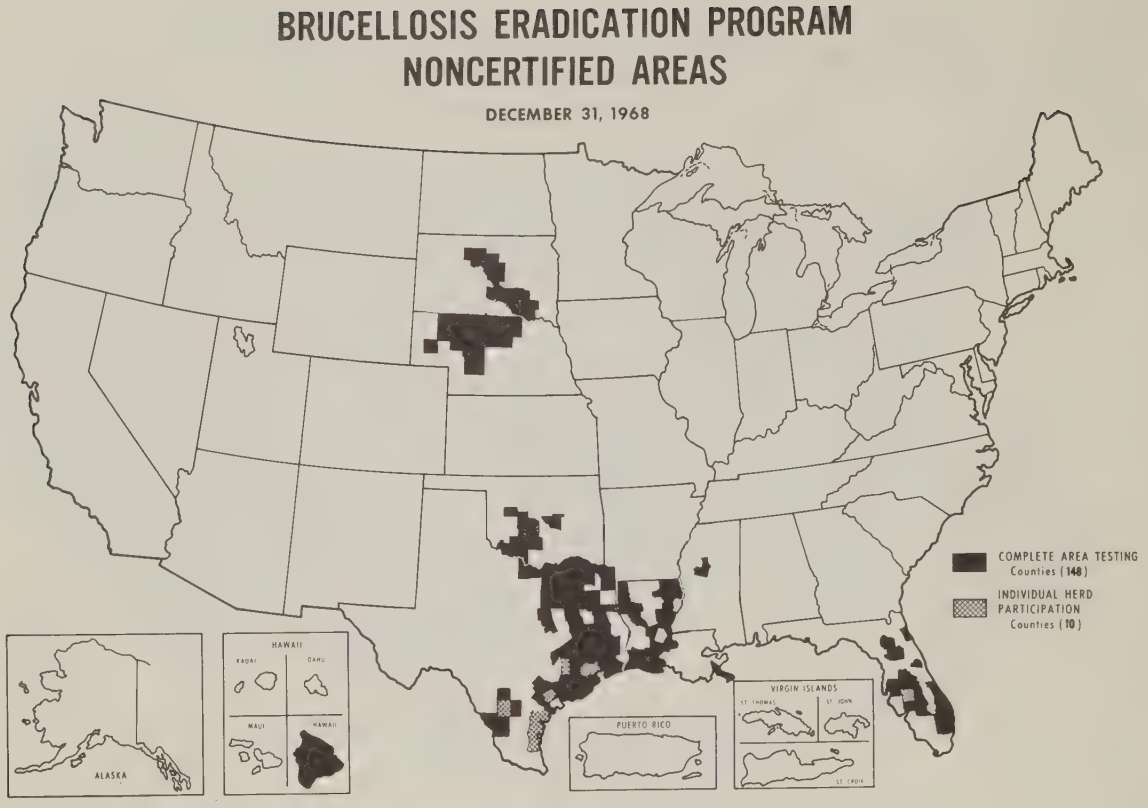


Figure 5.

Noncertified States

Florida

Eight counties were certified in 1968 making a total of 52 certified counties. Fourteen of the remaining 15 counties are engaged in area testing. Court action testing the legality of State laws is now pending. An adverse decision by the Florida Supreme Court will delay the completion of work in Florida.

Hawaii

Hawaii will be eligible for Modified Certified Brucellosis status when testing is completed on one herd of cattle which has proved difficult to handle. The incidence of brucellosis is very low with only eight herds found infected last year. It is unfortunate that this problem has created a temporary roadblock to attaining a modified certified status.

Louisiana

Twelve counties were modified certified in 1968. As of December 31, 1968, Louisiana had 39 modified counties and testing was being accelerated in the remaining 25 counties. MCT, followup herd tests, and area testing are continuing at a high level. The State is expected to become a Modified Certified Brucellosis Area in 1969--hopefully, before July 1, 1969.

Nebraska

Certification has been completed in 76 Nebraska counties. Area testing is underway in the remaining 17 counties. The MCT program is used extensively in the western range areas. The State is expected to qualify as a Modified Certified Brucellosis Area by July 1969.

Oklahoma

In Oklahoma, 68 counties had reached a modified certified status at the end of 1968; and area testing is underway in the remaining nine counties. The MCT program has been expanded and is being used successfully. Continuation of the current high level activities should result in Oklahoma reaching a Modified Certified Brucellosis Area status by July 1969.

South Dakota

Fifty-five of South Dakota's 67 counties were modified certified at years end. Area testing is underway in the 12 remaining non-certified counties. The State should become a Modified Certified Brucellosis Area by July 1, 1969.

Texas

Substantial gains were made in 1968. As of December 31, 1968, a total of 177 counties were modified certified; and area testing was underway in 68 counties. Nine counties have not submitted petitions requesting area work to start. Some delay is caused by personnel shortage and a higher rate of infection in East Texas. If additional funds and manpower can be provided, Texas should reach a Modified Certified Brucellosis Area status within the next 2 years.

In summary, it appears that all States, except Texas and Florida, will be modified certified during 1969.

Brucellosis Ring Test

The brucellosis ring test (BRT) has proved to be one of the most effective tools we have at our disposal for locating infected dairy herds. Since its adoption in 1952, the percentage of herds suspicious to the test has continued to decline. When first adopted, over 25 percent of the tests were suspicious. In 1967, this percentage had been reduced to 0.5 percent; and last year it was further reduced to 0.4 percent (fig. 6). Initial followup blood tests of 5,407 suspicious BRT herds made last year resulted in locating 1,166 infected herds which contained 3,119 reactors. The efficiency of the test is increased as the frequency of application is increased. For this reason, the majority of States are now conducting the test at 3-month intervals.

Constant review of the procedures used in collecting the sample and conducting the test are necessary to avoid problems of unfavorable changes in sensitivity of the test. Size of herds; type of sample, that is, fresh or preserved; preservatives used; and storage time and temperature are some of the factors that must be known and constantly evaluated, if we are to continue to have an effective test.

Last year, reactors were found in 21 percent of the BRT suspicious herds when tested. An average of 2.7 reactors were found per infected herd. These percentages are approximately the same as in 1967 indicating that the sensitivity of the test was maintained at the desired level.

The BRT on dairy herds, along with the MCT program for beef herds, is not only an effective tool in eradicating brucellosis but will continue to serve as our most efficient means of maintaining surveillance in Certified Brucellosis-Free Areas.

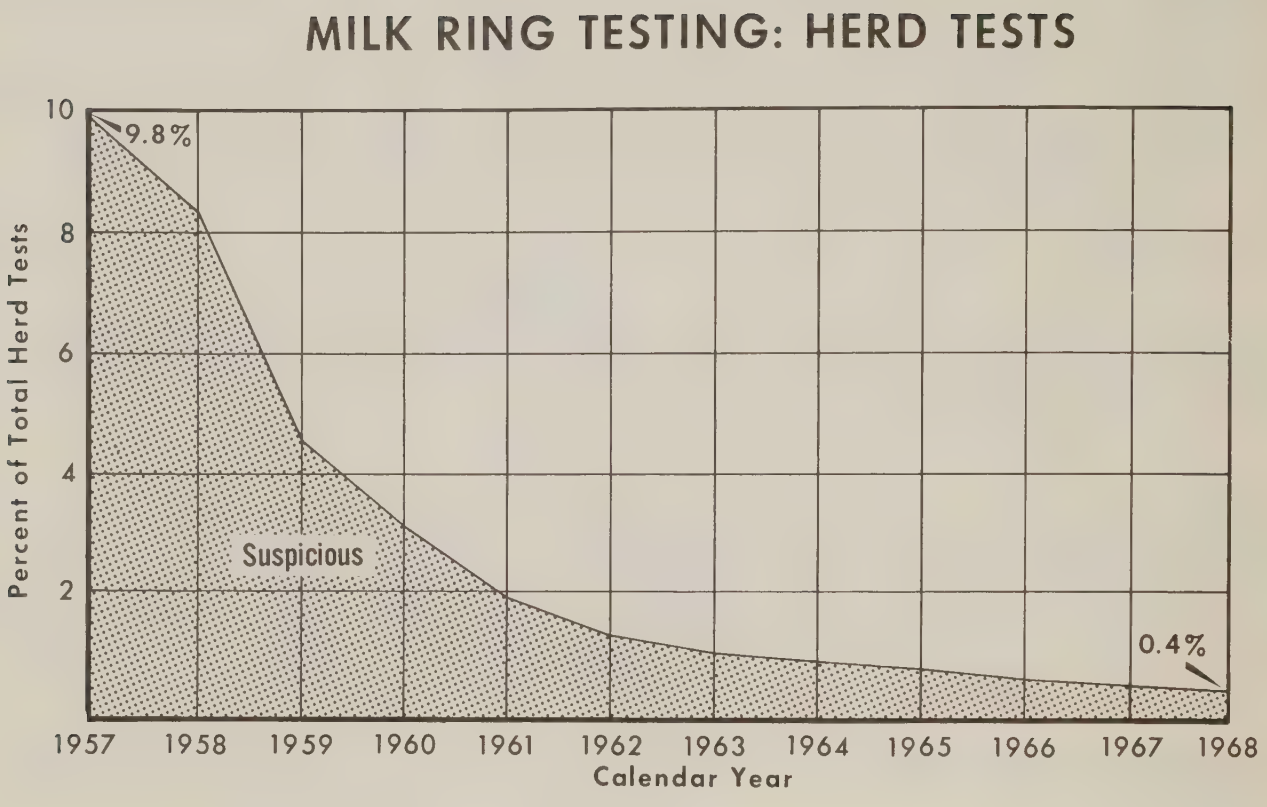


Figure 6.

Market Cattle Testing

The market cattle testing (MCT) program is proving to be as important in locating infected beef herds as the BRT is in locating infected dairy herds.

Last year there was an increase of approximately 200,000 in the number of blood test samples collected from identified cattle (fig. 7). This increase occurred entirely in identified cattle that were sampled at slaughter plants. The major factor responsible for the increase was due to the adoption by additional markets of the "multipurpose tag" for use as a salestag. At years end, over 600 markets in 25 States had adopted this two-color tag compared with 350 at the end of 1967.

As a result of initial tests of 11,299 herds of origin of MCT reactors, 4,017 infected herds were found with 22,339 reactors. During the year, a significant improvement was made in reducing the number of MCT reactors that could not be traced to herds of origin.

There are a number of problems preventing the full utilization of this highly economical and effective tool for locating reactor herds. One of these involves the large number of cattle that are moved directly to slaughter. Last year, over one-half of all slaughter cattle were in this category and did not move through livestock markets at which point backtags are normally applied. Identity of additional animals is lost when cattle are backtagged at auctions but are purchased by traders and feeders and placed on feed or pasture for periods up to 4 months before finally going to slaughter.

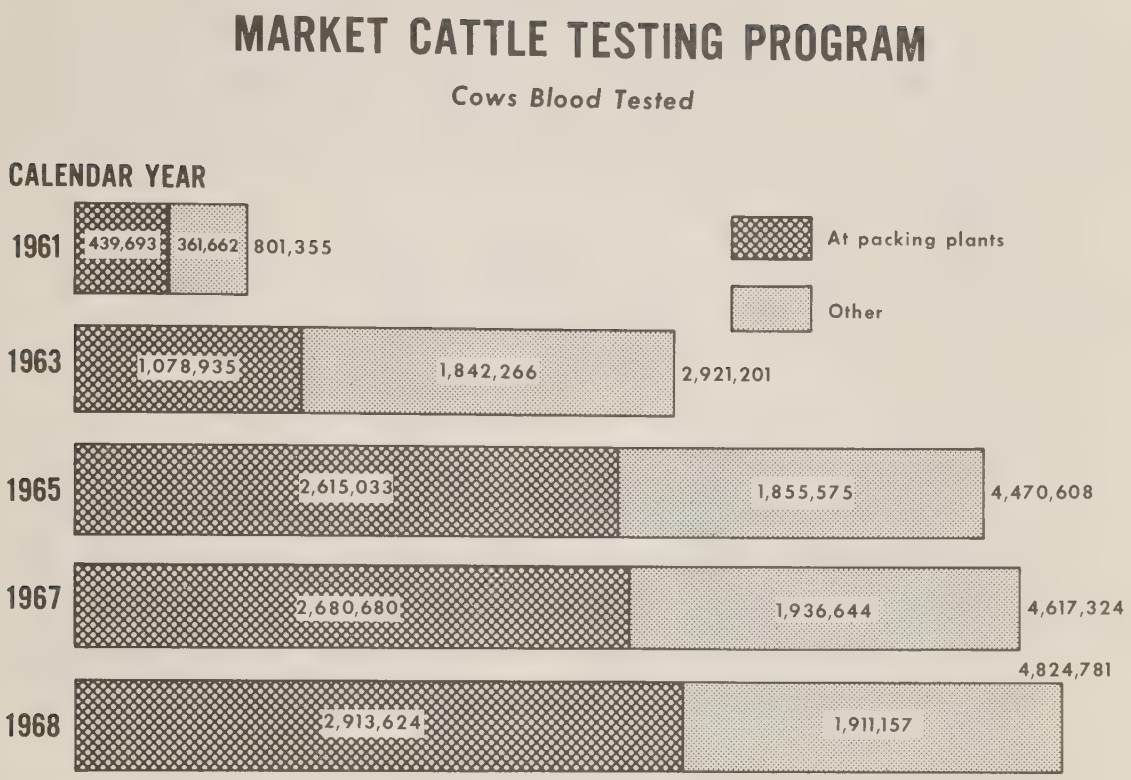


Figure 7.

As with the BRT program, we must constantly review the program to be sure that we are obtaining complete coverage of the population. The effectiveness with which we apply these two surveillance programs--BRT and MCT--will determine to a great extent our success or failure in meeting the 1975 eradication goal.

In 1968 there was a slight decrease in the total number of cattle blood tested. This is to be expected as a result of a lower incidence of the disease as we move toward final eradication. Because we found fewer MCT reactors and BRT suspicious herds in 1968, the total number of farm and ranch tests decreased. Likewise, the number of reactors found was reduced from 152,000 in 1967 to 146,000 last year (fig. 8).

The number of reactors found in noncertified States is remaining above 100,000 per year despite the fact that the number of these States is being reduced each year. In 1967, approximately 113,000 reactors were found in 10 noncertified States while in 1968 almost 108,000 in eight States were found. Likewise, the volume of reactors found in modified States remains relatively constant. These figures reflect the concentrated efforts being made in both noncertified and modified certified States to locate infected herds.

In Certified Brucellosis-Free States, the number of reactors found was reduced by 200 during 1968. In 1967, 917 reactors were found in 13 certified free States, while in 1968, only 717 in 14 certified free States and the Virgin Islands (fig. 9).

BLOOD TESTING: CATTLE

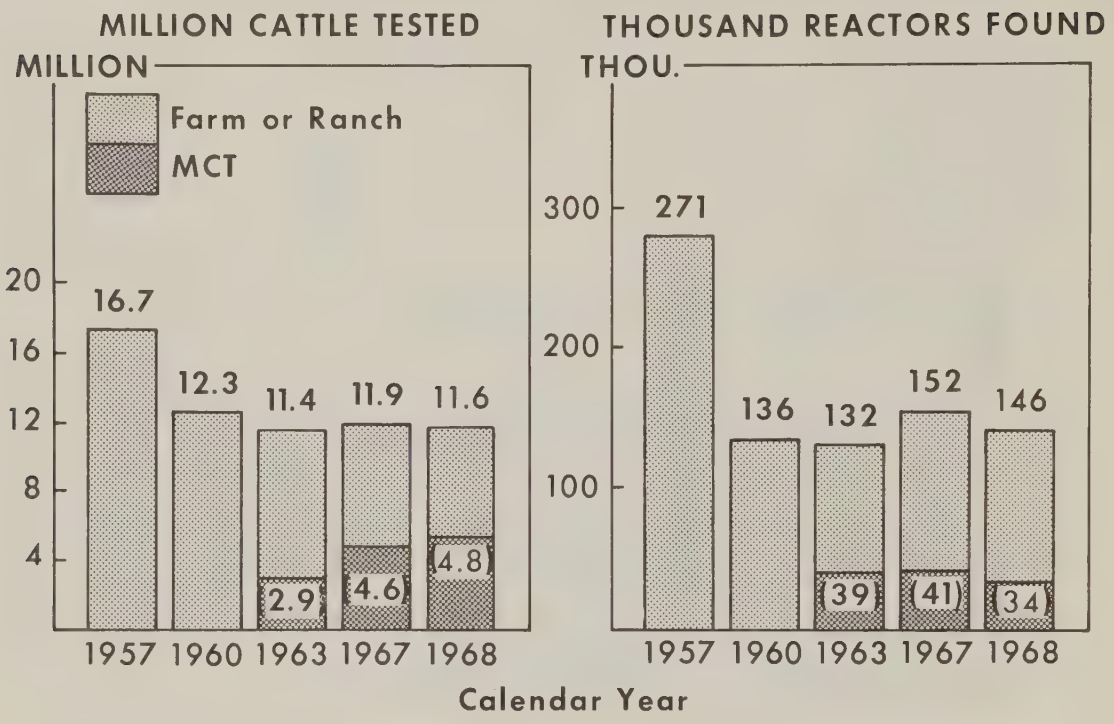
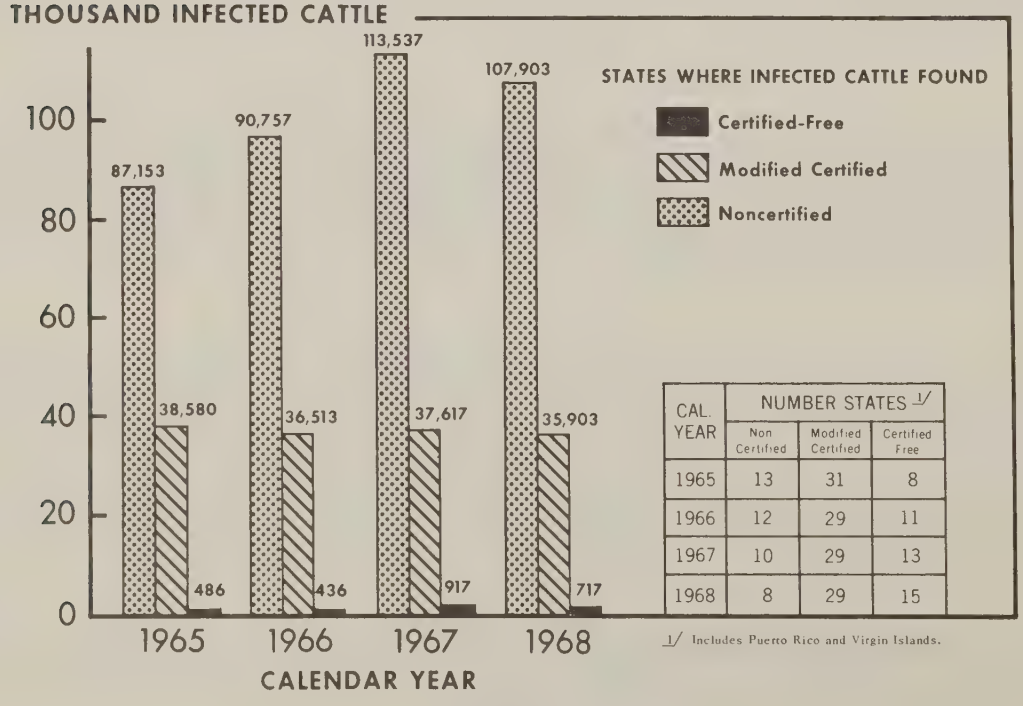


Figure 8.

BRUCELLOSIS INFECTED CATTLE FOUND

In Noncertified, Modified Certified and Certified-Free States



CAL. YEAR	NUMBER STATES 1/		
	Non Certified	Modified Certified	Certified Free
1965	13	31	8
1966	12	29	11
1967	10	29	13
1968	8	29	15

1/ Includes Puerto Rico and Virgin Islands.

Figure 9.

Vaccination

It is well recognized that vaccination can play an important part in a brucellosis "control" program. There is no question about its importance in the past in limiting the spread of brucellosis until eradication programs had reduced the incidence to low levels. However, its continued use cannot be justified in areas relatively free of brucellosis if we are to completely eradicate the disease.

In 1968, over 800,000 fewer calves were vaccinated than in 1967 (fig. 10). This is encouraging. However, there were still over 1 million calves vaccinated in the 14 Certified Brucellosis-Free States.

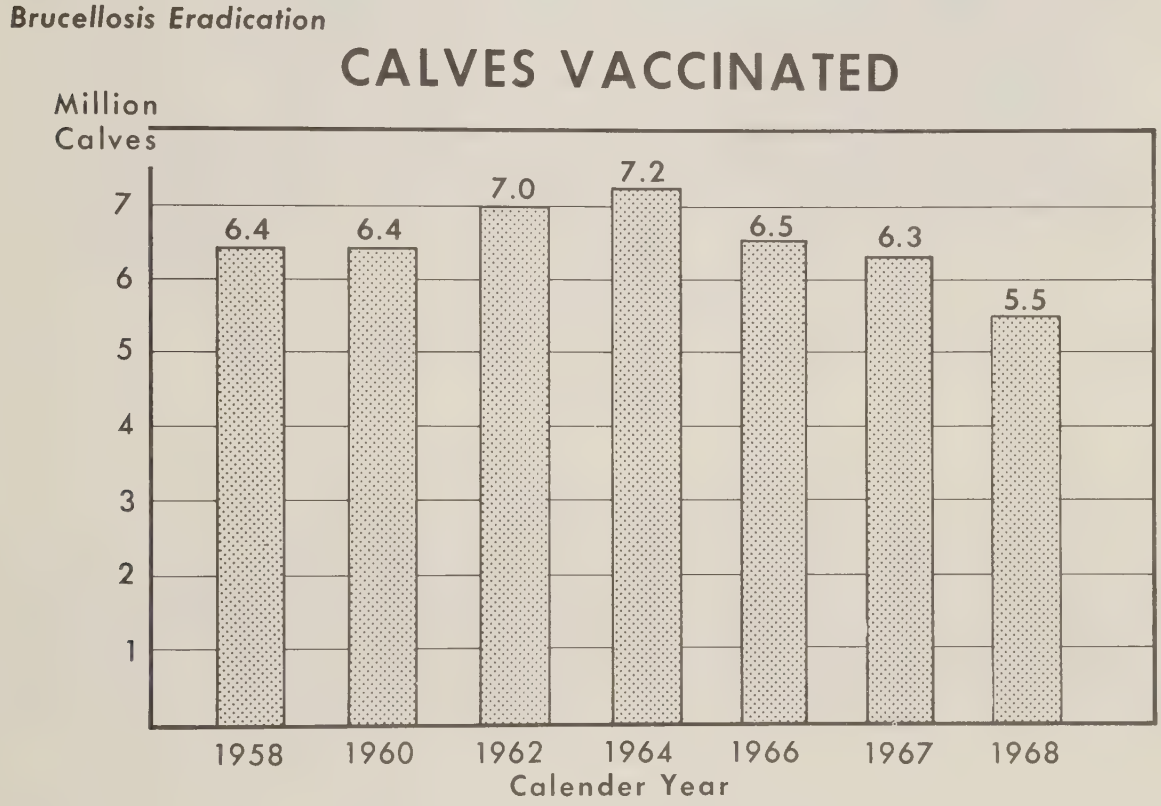


Figure 10.

Unfortunately, there is little correlation between the justification for continued vaccination and its actual use. In nine of the Certified Brucellosis-Free States, over 50 percent of the eligible calves were vaccinated. In an additional three free States, over 40 percent were vaccinated. This is a rather sharp contrast to the low level vaccination in some of the noncertified States in which vaccination may still be justified because of a relatively high incidence of infection (fig. 11).

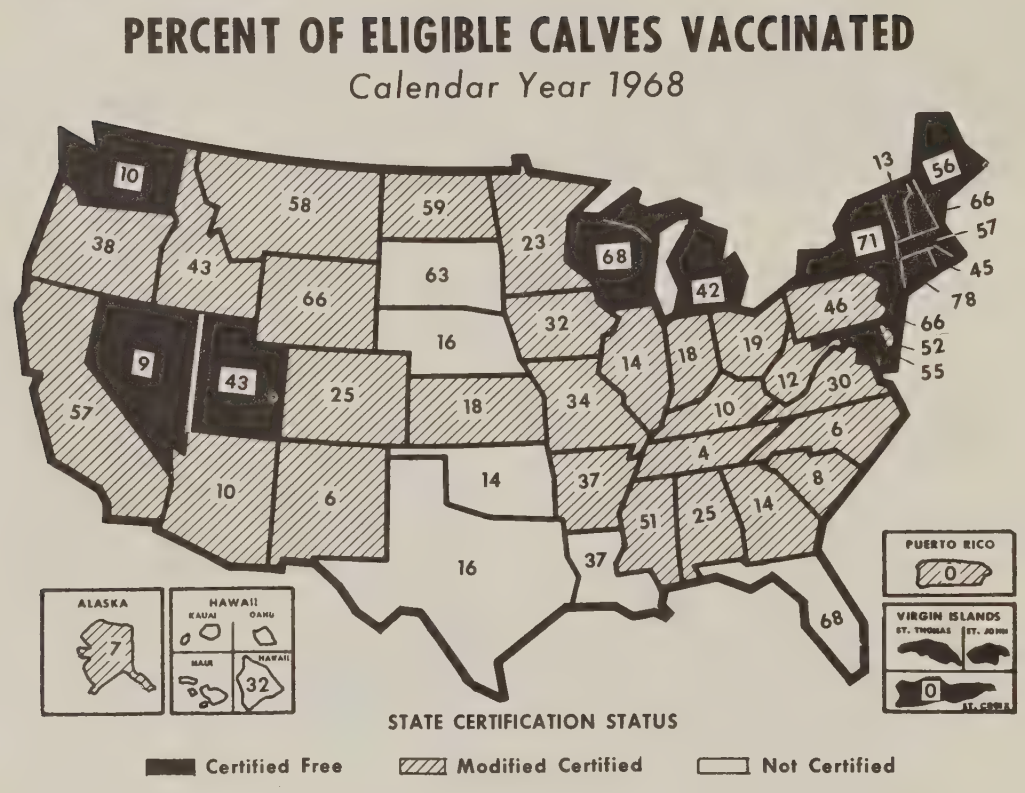


Figure 11.

The use of Strain 19 in certified States must be drastically reduced. Continued use of vaccination will only prolong the time that it takes to achieve eradication. The minimal advantages of vaccination in certified areas are far outweighed by the problems vaccination causes in diagnosis and by the failure of the occasional heifer to overcome the infection induced by the live vaccine. Although these are not common and as of yet there is little evidence that brucellosis resulting from Strain 19 has spread to other cattle, it does cause concern.

The continued use of Strain 19 is justified and encouraged in those few areas not yet certified in which the incidence of brucellosis is still relatively high. Even in those areas where effective eradication programs are rapidly being carried out, it should be recognized that the need for vaccination will decrease rapidly.

Fortunately, the level of vaccination is decreasing. As more counties become modified certified and as additional States reach a Certified Brucellosis-Free Area status, it is essential that the use of vaccine be further decreased (fig. 12). With the attainment of complete eradication of brucellosis in the near future, we must plan for the eventual complete elimination of vaccination.

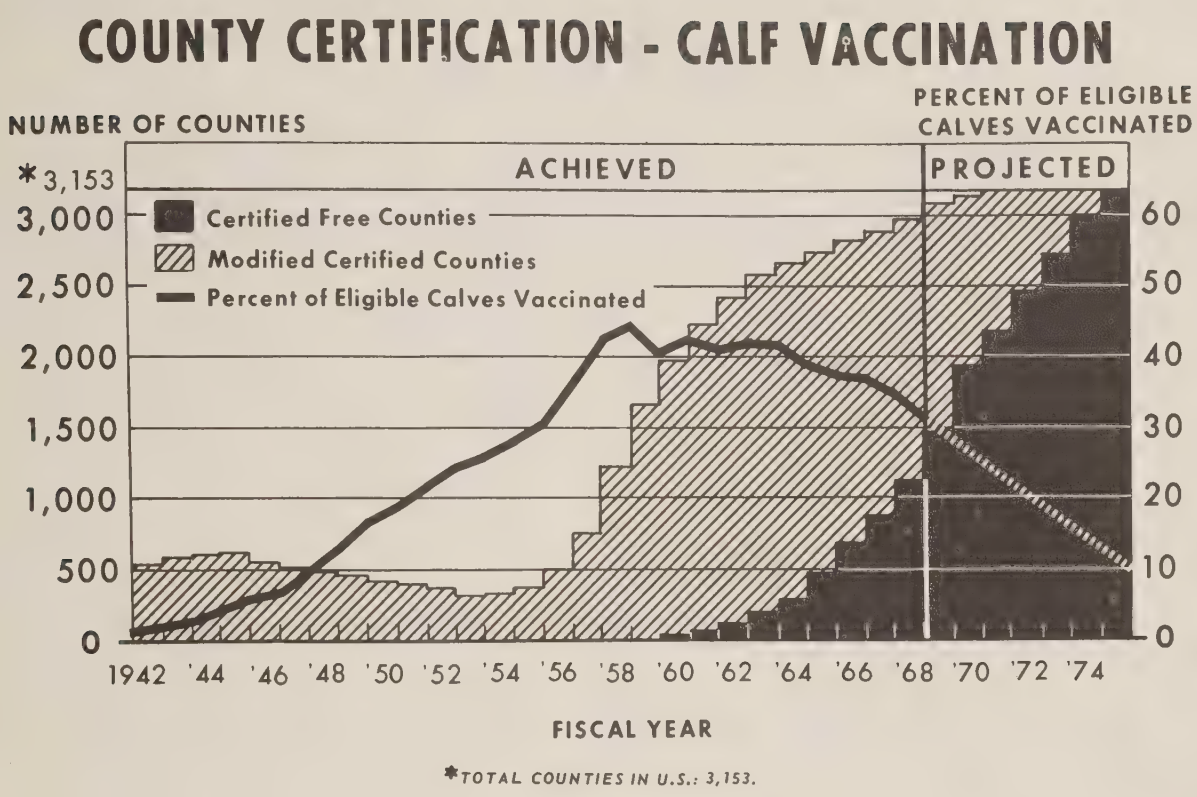


Figure 12.

Epidemiology

The training and utilization of brucellosis epidemiologists in a program of problem herd work have proved to be of significant value. These specialists are now located in 36 States and are available to every State in which their services are needed. As a result of their prompt investigations of problem herds and the application of their recommendations, most such herds are promptly freed of infection. These epidemiologists are under the technical supervision of six regional epidemiologists. We are training an additional 12 epidemiologists at our National Animal Disease Laboratory in Ames, Iowa.

This work has proved that infections in most herds can be quickly eliminated if standard procedures are vigorously applied. The battery of supplemental tests reinforces the effectiveness of the standard procedures. In the few herds that have not responded to these procedures, we usually find other factors involved such as failure to carry out all recommended procedures or physical problems involving the handling of cattle. Authority is provided for the depopulation of herds where recommended procedures have failed to eliminate the disease. This authority was used in depopulation of 10 complete herds in five States during the past year. This compares with seven herds in three States which were depopulated during 1967.

Again, I want to emphasize that I am convinced that we can eradicate brucellosis by 1975.

SUMMARY OF BRUCELLOSIS ERADICATION ACTIVITIES IN COOPERATION WITH THE VARIOUS STATES UNDER THE MARKET CATTLE TESTING PROGRAM CALENDAR YEAR 1968

STATE OR TERRITORY	LABORATORY TESTS OF COWS ORIGINATING IN THIS STATE					INITIAL MCT FOLLOW-UP TESTING						
	LABS IN THIS STATE	LABS IN OTHER STATES	TOTAL TESTS	REACTORS	INF. RATE PER 10,000 ANIMALS	TOTAL TESTED		INFECTED HERDS			PER CENT HERD INFECTION	INF. RATE PER 10,000 ANIMALS
						HERDS	CATTLE	HERDS	CATTLE	REACTORS		
Alabama	115,916	27,520	143,436	1,595	111.2	581	21,780	243	10,803	1,420	41.7	652.0
Alaska	299	--	299	--	0.0	--	--	--	--	--	0.0	0.0
Arizona	13,917	6,582	20,499	8	3.9	8	769	1	306	101	12.5	1,313.4
Arkansas	120,637	27,127	147,764	1,098	74.3	494	13,818	145	5,669	662	29.4	479.1
California	129,197	1,658	130,855	124	9.5	77	5,422	16	1,577	59	20.8	108.8
Colorado	34,331	17,998	52,329	62	11.8	138	7,493	44	2,777	315	31.9	420.4
Connecticut	--	--	--	--	0.0	--	--	--	--	--	0.0	0.0
Delaware	127	1,172	1,299	1	7.7	--	--	--	--	--	0.0	0.0
Florida	107,859	4,912	112,771	1,949	172.8	282	15,521	89	7,075	639	31.6	411.7
Georgia	168,386	8,748	177,134	785	44.3	339	12,974	143	5,218	863	42.2	665.2
Hawaii	17,204	--	17,204	11	6.4	8	238	1	136	13	12.5	546.2
Idaho	29,885	51,545	81,430	130	16.0	39	3,329	10	1,536	55	25.6	165.2
Illinois	85,343	69,798	155,141	612	39.4	405	10,617	86	3,309	365	21.2	343.8
Indiana	38,763	45,147	83,910	182	21.7	117	3,128	15	480	196	12.8	626.6
Iowa	211,097	57,335	268,432	1,548	57.7	391	11,137	68	2,112	228	17.4	204.7
Kansas	124,559	56,379	180,938	612	33.8	577	21,693	130	6,172	627	22.5	289.0
Kentucky	108,061	58,937	166,998	1,006	60.2	562	15,146	109	3,751	406	19.4	268.1
Louisiana	122,294	20,696	142,990	3,020	211.2	1,368	54,388	760	38,217	4,577	55.6	841.5
Maine	16,596	175	16,771	--	0.0	3	67	--	--	--	0.0	0.0
Maryland	12,947	20,055	33,002	5	1.5	6	231	--	--	--	0.0	0.0
Massachusetts	--	--	--	--	0.0	--	--	--	--	--	0.0	0.0
Michigan	97,983	2,722	100,705	88	8.7	64	3,042	1	29	5	1.6	16.4
Minnesota	107,617	17,634	125,251	79	6.3	55	1,805	6	308	59	11.0	326.9
Mississippi	170,536	19,992	190,528	2,874	150.8	1,201	34,082	583	18,904	3,218	48.5	944.2
Missouri	173,855	76,599	250,454	974	38.9	630	18,772	180	6,387	669	28.6	356.4
Montana	25,987	62,664	88,651	38	4.3	42	2,164	4	190	11	9.5	50.8
Nebraska	129,355	33,031	162,386	258	15.9	212	13,542	64	4,383	300	30.2	221.5
Nevada	1,740	10,985	12,725	1	0.8	4	799	2	277	31	50.0	388.0
New Hampshire	--	81	81	--	0.0	--	--	--	--	--	0.0	0.0
New Jersey	2	1,515	1,517	--	0.0	--	--	--	--	--	0.0	0.0
New Mexico	14,526	15,763	30,289	82	27.1	36	4,756	11	2,596	115	30.6	241.8
New York	3,698	142	3,840	1	2.6	--	--	--	--	--	0.0	0.0
North Carolina	73,410	14,334	87,744	88	10.0	92	3,580	8	127	30	8.7	83.8
North Dakota	32,238	60,213	92,451	84	9.1	63	3,130	21	1,213	111	33.3	354.6
Ohio	42,579	7,331	49,910	19	3.8	48	1,120	17	591	84	35.4	750.0
Oklahoma	281,410	72,026	353,436	4,426	125.2	1,347	41,434	529	20,017	2,481	39.3	598.8
Oregon	68,238	23,418	91,656	64	7.0	49	4,277	5	972	60	10.2	140.3
Pennsylvania	54,666	12,284	66,950	188	28.1	--	--	--	--	--	0.0	0.0
Rhode Island	--	--	--	--	0.0	--	--	--	--	--	0.0	0.0
South Carolina	38,914	9,080	47,994	36	7.5	31	869	3	39	17	9.7	195.6
South Dakota	69,120	74,413	143,533	349	24.3	119	6,567	58	3,439	396	48.7	603.0
Tennessee	113,358	19,219	132,577	1,075	81.1	551	15,290	196	5,774	1,047	35.6	684.8
Texas	438,224	21,974	460,198	10,832	235.4	1,060	50,232	447	30,259	2,993	42.2	595.8
Utah	54,366	3,875	58,241	24	4.1	18	1,273	4	417	55	22.2	432.1
Vermont	38	15	53	--	0.0	--	--	--	--	--	0.0	0.0
Virginia	42,247	41,852	84,099	114	13.6	173	5,138	15	398	52	8.7	101.2
Washington	68,531	8,700	77,231	39	5.0	17	720	--	--	--	0.0	0.0
West Virginia	44,172	6,494	50,666	25	4.9	72	1,480	3	63	7	4.2	47.3
Wisconsin	38,319	12,506	50,825	2	0.4	6	131	1	52	9	16.7	687.0
Wyoming	5,200	28,758	33,958	24	7.1	18	2,120	8	900	97	44.4	457.5
Puerto Rico	42,930	--	42,930	81	18.9	30	1,503	1	183	1	3.3	6.7
Virgin Islands	700	--	700	--	0.0	--	--	--	--	--	0.0	0.0
TOTALS	3,691,377	1,133,404	4,824,781	34,613	71.7	11,333	415,577	4,027	186,656	22,374	35.5	538.4

SUMMARY OF BOVINE BRUCELLOSIS ERADICATION ACTIVITIES IN COOPERATION WITH THE STATES
CALENDAR YEAR 1968

STATE OR TERRITORY	CATTLE BLOOD TESTED ON FARM OR RANCH						BRUCELLOSIS RING TESTS						FREQUENCY OF BRT ROUNDS PER YEAR	CATTLE TESTED ON FARM AND BRT NEGATIVE	MARKET CATTLE TESTS		CATTLE TESTED ON FARM, AND MCT AND BRT NEGATIVE	CALVES VACCINATED
	TOTAL TESTED		INFECTED HERDS		REACTORS		TESTS	ESTIMATED CATTLE REPRESENTED	SUSPICIOUS TESTS		NEGATIVE TESTS	NEGATIVE CATTLE REPRESENTED			CATTLE	REACTORS		
	HERDS	CATTLE	NUMBER	PERCENT 1/	NUMBER	RATE 2/			NUMBER	PERCENT				RATE 3/ CATTLE INFECTION			RATE 4/ CATTLE INFECTION	
Alabama	4,547	163,310	1,326	29.2	5,304	324.78	4,457	250,979	128	2.9	4,329	243,459	3	216.96	143,436	1,595	177.85	64,082
Alaska	42	211	--	0.0	--	0.00	244	14,737	--	0.0	244	14,737	4	0.00	299	--	0.00	116
Arizona	860	15,371	6	0.7	108	70.26	781	177,012	3	0.4	778	175,773	4	18.20	20,499	8	14.53	16,213
Arkansas	2,971	70,520	515	17.3	1,806	256.09	14,125	169,500	65	0.5	14,060	168,720	4	160.24	147,764	1,098	111.49	87,412
California	4,160	55,442	82	2.0	189	34.08	19,023	2,885,823	79	0.4	18,944	2,869,111	4	2.64	130,855	124	3.46	405,727
Colorado	3,741	56,253	202	5.4	728	129.41	6,157	208,084	48	0.8	6,109	205,351	4	67.66	52,329	62	49.40	114,372
Connecticut	2,920	46,010	1	0.0	1	0.21	5,482	144,758	6	0.1	5,476	144,600	4	0.12	--	--	0.12	16,014
Delaware	831	17,575	2	0.2	2	1.13	1,223	39,827	4	0.3	1,219	39,739	4	0.72	1,299	1	1.04	2,094
Florida	7,146	324,823	1,194	16.7	7,483	230.37	2,142	587,162	351	16.4	1,791	420,528	4	174.04	112,771	1,949	173.88	122,677
Georgia	3,961	125,522	725	18.3	2,439	194.30	5,985	239,400	84	1.4	5,901	236,040	3.5	126.39	177,134	785	87.11	36,248
Hawaii	263	7,865	8	3.0	28	35.60	186	51,834	5	2.7	181	51,056	4	13.57	17,204	11	10.30	9,265
Idaho	1,138	17,264	61	1.4	251	145.38	30,403	441,495	89	0.3	30,314	440,202	4	19.71	81,430	130	18.66	120,542
Illinois	21,604	213,919	808	3.7	1,824	85.26	49,597	499,224	60	0.1	49,537	498,665	4	53.87	155,141	612	49.33	80,135
Indiana	9,570	109,925	136	1.4	416	37.84	38,241	458,892	128	0.3	38,113	457,356	3	15.85	83,910	182	17.26	62,233
Iowa	27,490	238,755	495	1.8	1,077	45.10	96,464	1,977,996	584	0.6	95,880	1,966,104	3	12.04	268,432	1,548	22.57	480,498
Kansas	5,742	72,285	414	7.2	1,562	216.08	28,770	575,040	159	0.6	28,611	571,860	3	59.41	180,938	612	48.98	206,622
Kentucky	4,796	92,387	529	7.8	1,319	142.76	58,297	811,206	514	0.9	57,783	804,058	3	36.59	166,998	1,006	44.08	38,509
Louisiana	16,939	444,953	4,329	25.6	17,017	382.44	3,919	266,492	64	1.6	3,855	262,140	2	295.42	142,990	3,020	278.67	76,894
Maine	873	9,595	4	0.5	5	5.21	5,208	218,470	6	0.1	5,202	218,280	3	0.60	16,771	--	0.50	15,082
Maryland	4,066	85,044	28	0.7	29	3.40	12,965	699,154	133	1.0	12,832	692,435	4	1.12	33,002	5	1.16	32,354
Massachusetts	707	10,935	6	0.8	6	5.48	6,579	263,160	20	0.3	6,559	262,360	4	0.78	--	--	0.78	10,621
Michigan	8,053	63,878	62	0.8	143	22.38	56,047	1,362,665	420	0.7	55,627	1,355,073	3	2.77	100,705	88	3.74	118,061
Minnesota	17,309	239,588	170	1.0	520	21.70	193,819	3,876,380	185	0.1	193,634	3,872,680	4	4.30	125,251	79	4.49	174,164
Mississippi	14,627	311,251	3,561	24.3	13,865	445.46	10,511	371,800	173	1.6	10,338	365,390	4	344.38	190,528	2,874	282.21	108,272
Missouri	12,162	159,843	916	7.5	2,276	142.38	70,728	1,033,412	588	0.8	70,140	1,024,827	4	54.70	250,454	974	48.76	262,011
Montana	1,448	24,459	31	2.1	176	71.95	7,080	70,800	14	0.2	7,066	70,660	4	41.78	88,651	38	16.36	262,839
Nebraska	6,751	145,366	354	5.2	1,156	79.52	39,642	494,885	108	0.3	39,534	493,580	4	43.01	162,386	258	32.14	486,328
Nevada	284	11,512	9	3.2	81	70.36	438	33,101	--	0.0	438	33,101	4	40.93	12,725	1	25.22	7,120
New Hampshire	2,851	47,630	1	0.0	1	0.20	3,716	148,430	7	0.2	3,709	148,254	4	0.11	81	--	0.11	9,261
New Jersey	2,092	43,936	3	0.1	4	0.91	5,948	201,025	13	0.2	5,935	200,637	4	0.42	1,517	--	0.42	11,938
New Mexico	1,390	28,562	58	4.2	272	95.23	1,036	33,115	23	2.2	1,013	32,463	4	74.16	30,289	82	52.86	11,270
New York	5,347	64,708	26	0.5	36	5.56	98,325	3,292,479	85	0.1	98,240	3,289,627	4	0.40	3,840	1	0.41	212,150
North Carolina	5,530	145,074	89	1.6	159	10.95	18,428	582,040	84	0.5	18,344	579,880	4	5.48	87,744	88	6.53	7,659
North Dakota	1,768	21,139	93	5.3	287	135.76	29,953	446,512	90	0.3	29,863	445,178	3	16.92	92,451	84	14.41	209,533
Ohio	12,880	131,027	131	1.0	371	28.31	71,609	1,218,019	599	0.8	71,010	1,207,775	4	8.56	49,910	19	8.07	67,988
Oklahoma	22,163	508,056	4,012	18.0	13,846	271.99	8,300	166,000	66	0.8	8,234	164,680	3	245.51	353,436	4,426	199.17	103,710
Oregon	1,312	23,555	38	2.9	200	84.90	12,101	484,040	48	0.4	12,053	482,120	4	13.88	91,656	64	11.47	92,900
Pennsylvania	23,974	455,532	209	0.9	250	5.48	72,306	2,269,911	121	0.2	72,185	2,266,284	3	2.06	66,950	188	3.42	133,000
Rhode Island	564	6,536	--	0.0	--	0.00	978	39,120	5	0.5	973	38,920	4	0.00	--	--	0.00	1,124
South Carolina	1,361	51,305	32	2.4	93	18.12	4,314	128,670	61	1.4	4,253	127,525	4	11.17	47,994	36	8.83	6,922
South Dakota	6,501	146,813	625	9.6	2,651	180.56	23,373	511,206	104	0.4	23,269	511,918	3	83.50	143,533	349	65.07	474,917
Tennessee	4,409	91,515	706	16.1	2,584	282.35	62,205	684,255	324	0.5	61,881	680,691	4	98.74	132,577	1,075	92.80	14,115
Texas	53,750	1,379,398	8,237	15.3	29,221	211.83	12,311	861,770	258	2.1	12,053	843,710	3	175.96	460,198	10,832	188.85	262,986
Utah	1,371	22,187	49	3.6	173	77.97	10,805	323,735	23	0.2	10,782	323,460	4	16.80	58,241	24	12.22	48,578
Vermont	985	18,735	13	1.3	23	12.27	16,566	672,733	22	0.1	16,544	671,820	4	1.23	53	--	1.23	7,117
Virginia	6,412	130,557	90	1.4	287	21.98	28,837	792,850	189	0.7	28,648	789,060	4	8.75	84,099	114	9.73	65,487
Washington	1,334	9,119	1	0.1	1	1.09	17,175	587,245	54	0.3	17,121	586,570	4	0.06	77,231	39	1.71	22,719
West Virginia	1,691	33,704	15	0.9	33	9.79	7,302	80,322	50	0.7	7,252	79,772	4	6.15	50,666	25	5.56	7,113
Wisconsin	18,977	196,962	17	0.1	55	2.79	199,064	5,175,664	170	0.1	198,894	5,171,244	3	0.28	50,825	2	0.28	483,278
Wyoming	637	19,533	39	6.1	259	132.59	2,382	83,370	7	0.3	2,375	83,125	3	54.82	33,958	24	34.85	167,376
Puerto Rico	3,664	147,228	203	5.5	377	25.60	3,425	278,545	146	4.3	3,279	262,975	4	17.70	42,930	81	17.89	--
Virgin Islands	7	607	1	14.3	1	16.47	11	1,057	2	0.0	9	557	4	13.40	700	--	6.91	--
TOTALS	367,971	6,858,279	30,664	8.3	110,995	161.84	1,478,983	37,288,405	6,569	0.4	1,472,414	36,945,715		63.73	4,824,781	34,613	65.49	5,837,646

ANN FORM 4-44A
SEP 1967

1/ Percent of herd infection tested on farm or ranch.

2/ Cattle infection rate per 10,000 animals tested on farm or ranch.

3/ Cattle infection rate per 10,000 animals tested based on total cattle tested on farm and BRT negative tests adjusted for frequency.

4/ Cattle infection rate per 10,000 animals tested based on total cattle tested on farm, MCT and BRT negative tests adjusted for frequency.

BRUCELLOSIS TESTS OF GOATS AND SWINE, CALENDAR YEAR 1968

State or Territory	Goats					Swine			
	Tested		Infected			Tested		Infected	
	Lots	Animals	Lots	Animals	Suspects	Lots	Animals	Lots	Animals
	Number	Number	Number	Number	Number	Number	Number	Number	Number
Alabama	9	75	--	--	--	3,527	6,462	146	200
Alaska	5	11	--	--	1	6	27	--	--
Arizona	63	282	--	--	--	97	2,696	3	15
Arkansas	17	76	1	1	--	87	1,669	16	29
California	159	1,076	--	--	4	2,455	25,905	48	717
Colorado	158	425	3	3	3	84	3,141	--	--
Connecticut	--	--	--	--	--	54	896	7	66
Delaware	1	1	--	--	--	5	211	--	--
Florida	24	68	--	--	--	244	3,222	61	123
Georgia	12	23	--	--	--	458	7,080	18	108
Hawaii	1	3	--	--	--	763	5,789	98	192
Idaho	16	31	--	--	--	73	501	--	--
Illinois	62	223	--	--	--	6,542	51,003	81	334
Indiana	46	183	--	--	--	2,388	26,764	20	27
Iowa	46	225	1	1	--	26,281	199,390	377	536
Kansas	28	89	1	1	3	285	4,036	1	3
Kentucky	12	27	--	--	--	889	4,586	19	22
Louisiana	4	26	1	3	--	171	1,527	9	22
Maine	16	92	--	--	--	1,217	5,450	51	713
Maryland	36	165	--	--	1	183	2,239	2	2
Massachusetts	40	337	1	1	2	81	1,526	5	25
Michigan	40	178	--	--	--	87	694	--	--
Minnesota	7	13	--	--	--	1,043	11,418	10	16
Mississippi	11	21	--	--	--	74	1,013	4	22
Missouri	--	--	--	--	--	1,233	12,417	25	71
Montana	4	7	--	--	--	69	784	--	--
Nebraska	6	11	--	--	--	691	9,699	5	5
Nevada	15	28	--	--	--	180	1,906	3	5
New Hampshire	--	--	--	--	--	--	--	--	--
New Jersey	121	512	--	--	--	2	112	--	--
New Mexico	39	257	--	--	1	24	1,035	--	--
New York	47	214	--	--	1	164	960	--	--
North Carolina	14	171	--	--	--	326	6,046	17	119
North Dakota	1	2	--	--	--	89	1,135	1	1
Ohio	73	575	1	1	2	818	8,607	6	6
Oklahoma	42	87	--	--	--	495	2,356	1	1
Oregon	22	347	--	--	--	1,787	3,505	1	1
Pennsylvania	154	987	--	--	--	266	2,984	2	2
Rhode Island	20	87	--	--	--	16	364	4	6
South Carolina	10	131	--	--	--	154	2,251	7	19
South Dakota	5	21	--	--	--	484	4,513	3	3
Tennessee	7	56	--	--	--	169	1,394	--	--
Texas	21	1,835	--	--	1	124	3,193	5	6
Utah	18	143	--	--	--	3,921	8,785	--	--
Vermont	2	2	--	--	--	3	36	--	--
Virginia	15	47	--	--	--	158	3,786	4	55
Washington	24	47	--	--	--	25	200	--	--
West Virginia	5	19	--	--	--	875	4,085	--	--
Wisconsin	26	905	--	--	--	839	8,026	--	--
Wyoming	13	30	--	--	--	24	190	2	2
Puerto Rico	63	169	--	--	--	7,367	27,168	22	22
Virgin Islands	83	379	--	--	--	166	712	--	--
Total	1,663	10,719	9	11	19	67,563	483,494	1,084	3,496
Percent Infected			0.54	0.10	0.18			1.60	0.72

SWINE HERDS AND AREAS VALIDATED BRUCELLOSIS-FREE, A PROGRESS REPORT

By G. T. Fichtner[1]

The efforts that have been expended in the past decade to eliminate brucellosis from limited segments of the swine population have been generally successful. Although many States and owners of breeding stock have not made active commitments to eradicate swine brucellosis, there is evolving a realization that brucellosis-free breeding stock and brucellosis-free areas can be attained. The purpose of this progress report is to translate this realization into measurable accomplishment.

Validated Brucellosis-Free Herds

By December 31, 1968, there were 2,987 validated swine herds which could offer brucellosis-free replacement stock to prospective buyers (fig. 1). This represents an increase of 37 percent over the 1966 total of 2,186. These herds are located in 775 counties in 45 States and Puerto Rico. The leading States with validated herds include Iowa--705, Hawaii--442, California--403,

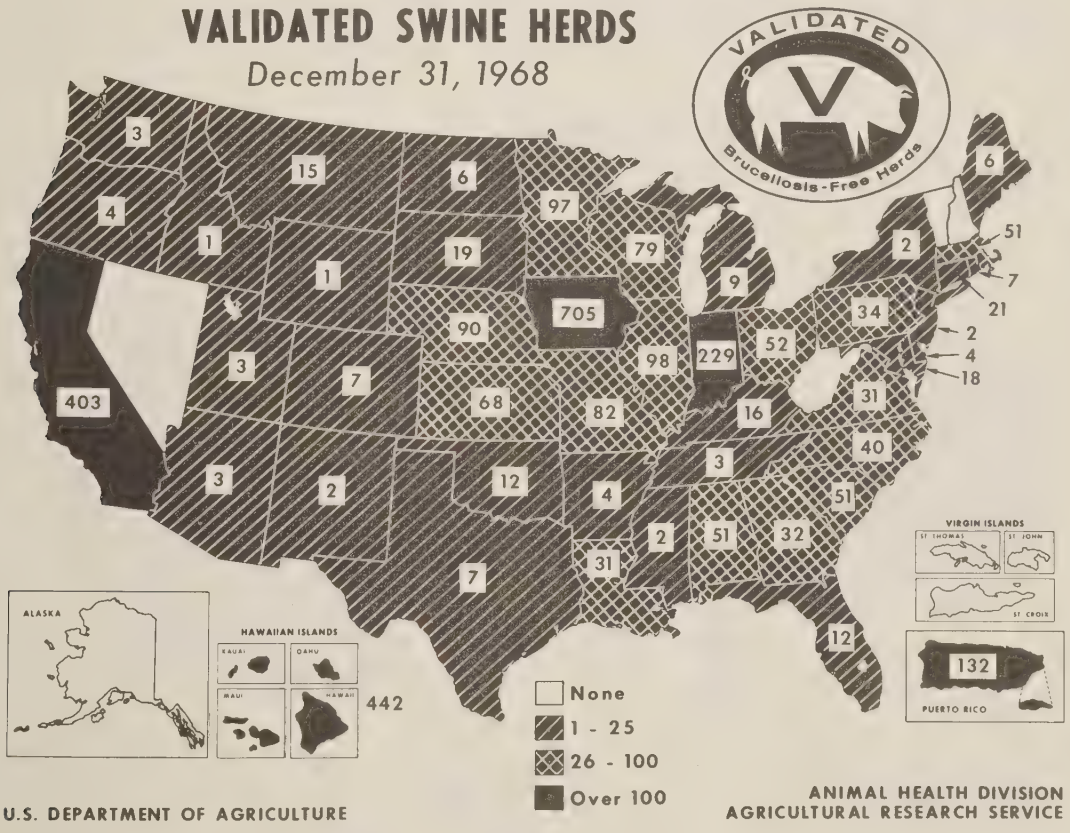


Figure 1.

[1] Assistant to Senior Staff Veterinarian, Swine Brucellosis Eradication, Animal Health Division, Agricultural Research Service, U.S. Department of Agriculture, Hyattsville, Md.

Indiana--229, Puerto Rico--132, Illinois--98, Minnesota--97, Nebraska--90, Missouri--82, Wisconsin--79, Kansas--68, Ohio--52, Massachusetts, Alabama, and South Carolina with 51 herds each.

In a recent national survey, the States anticipated that 3,140 herds would be validated by June 30, 1969. If accomplished, this would increase the current number of validated swine herds by approximately 44 percent since 1966.

Validated Brucellosis-Free Areas

Area validation progress has not accelerated in 1968. Currently, 163 counties enjoy this status (fig. 2). This represents an increase of 15 percent over the 1967's total of 144. All counties in Nevada, Utah, Vermont, and the Virgin Islands have attained Validated Brucellosis-Free Area status. Other States with validated counties include California--55, Puerto Rico--30, Massachusetts--8, Connecticut, Hawaii, and Tennessee--2 counties each, and Maryland--1. The total number of validated counties is expected to increase to 182 within the current fiscal year.

There are several reasons why area validation has not accelerated. These reasons include:

1. Lack of enthusiasm to acquire this status because of the belief that brucellosis does not represent a disease problem within the area's swine population.

2. Conventional farm-to-farm herd testing methods to qualify an area for validation are too expensive except in areas with a very small number of herds.

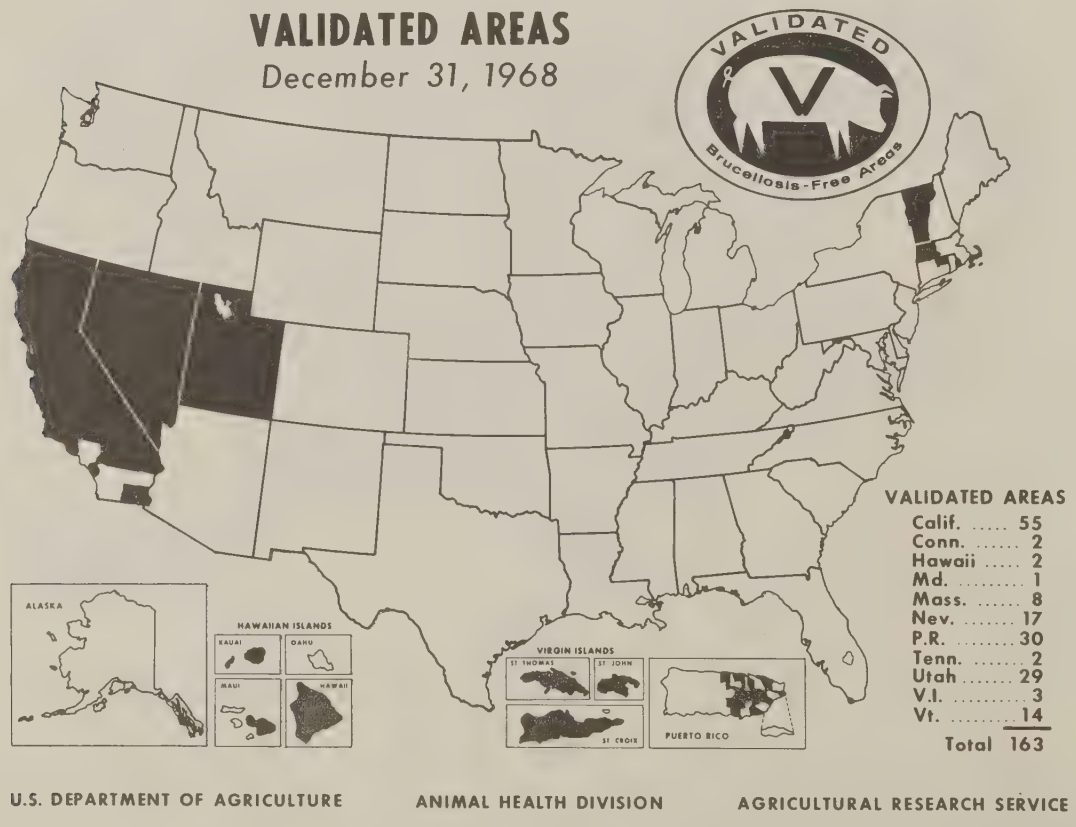


Figure 2.

3. If market swine testing procedures are used to validate an area, then individual blood samples obtained from breeding swine at slaughter must be traceable to the herd of origin. An identification system necessary to meet these needs has not been initiated nationally.

4. Some difficulties in quarantining and retesting brucellosis-infected herds within States attempting to attain validation status.

These are a few of the problems that collectively result in deterring area validation. Hopefully, these difficulties will resolve as more States enter into the area validation phase of swine brucellosis eradication.

Market Swine Testing Program

All States have been encouraged to develop market swine testing activities. The present goal of the Animal Health Division is to encourage the States to begin market swine testing (MST) in slaughter plants identifying or having the capability of identifying breeding swine back to the herd of origin. Work has been initiated in 17 States and Puerto Rico (fig. 3). Although the number of samples collected in some instances is minimal, recognition is given to those States where some efforts are being made in MST activity. Those States collecting blood samples in 1968 include Alabama, Arizona, California, Hawaii, Illinois, Iowa, Kentucky, Maine, Maryland, Montana, Nevada, New Mexico, New York, Oregon, Utah, Virginia, and West Virginia.

Several additional States have formulated plans to begin either pilot projects or active MST programs during the current fiscal year. These States include Arkansas, Colorado, Kansas, Massachusetts, Michigan, Missouri, North Carolina, Pennsylvania, Rhode Island, South Carolina, Tennessee, and Vermont.

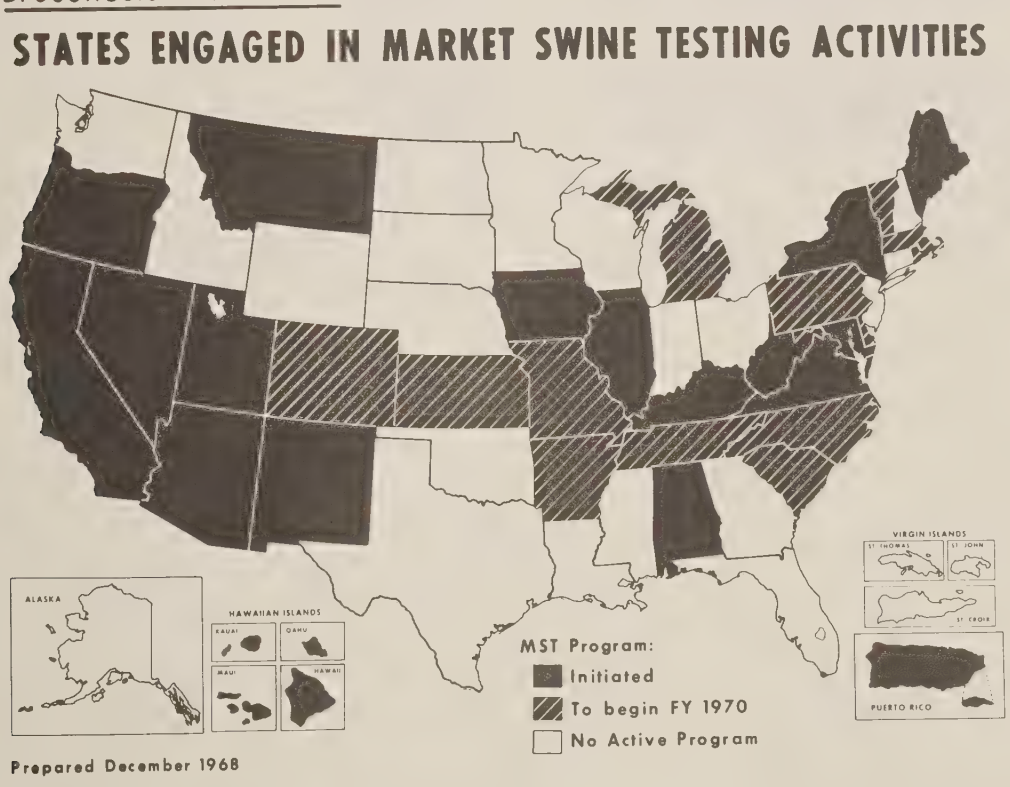


Figure 3.

Conclusion

In 1968, 67,563 lots were tested, (fig. 4), with 1,084 of these lots (1.6 percent) disclosing serological evidence of infection. The percent of infected herds continued to decline last year. The efforts toward eradicating swine brucellosis which were made in 1968 are not overwhelming. An increasing number of herd owners and a small percentage of the total United States counties have moved toward the goal of brucellosis-free herds and areas. Continued encouragement should be made in providing disease-free replacement stock from these validated herds and areas. It appears that continued emphasis must be placed on the market swine testing program to successfully detect and eradicate swine brucellosis. To accomplish this goal, the combined efforts of the entire swine industry will be required.

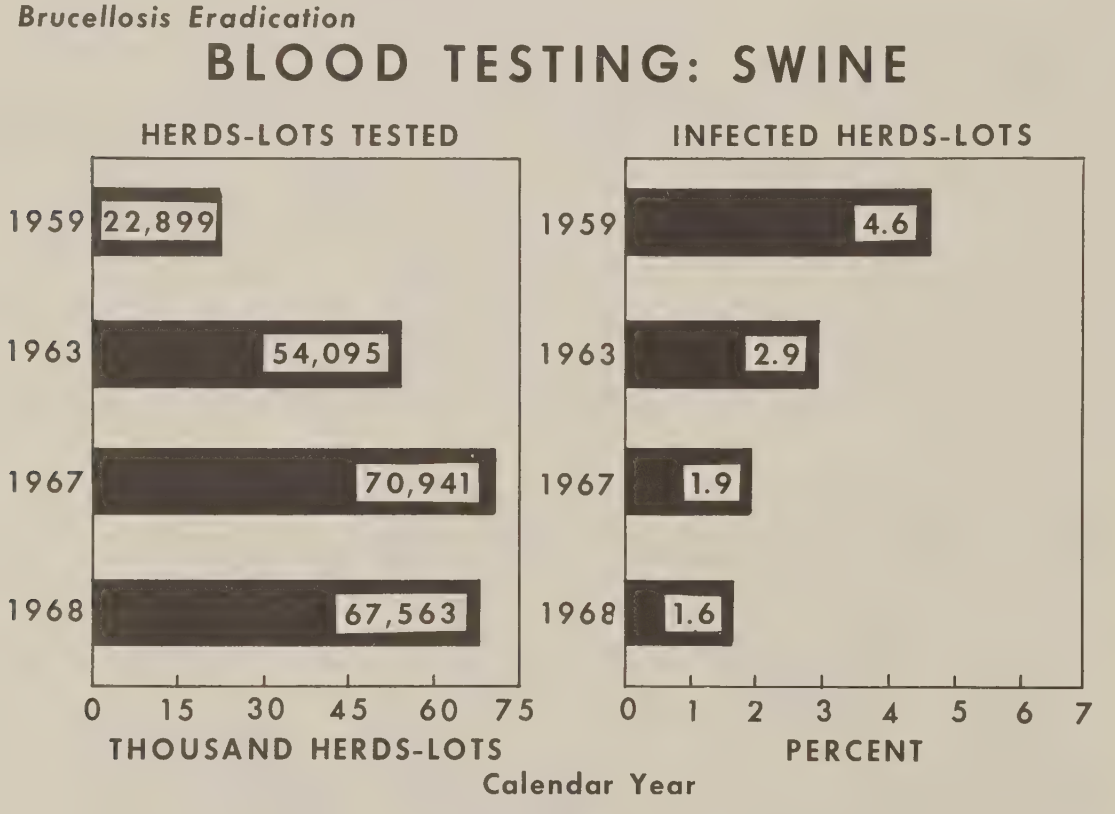


Figure 4.

MARKET SWINE TESTING PLANS

By E. A. Schilf [1]

Eradication of brucellosis from swine is one phase of the brucellosis eradication program that has been discussed considerably for several years. However, activity in swine brucellosis has been less than desirable.

There has been an increase in the number of validated herds since the program has been underway. This does increase the probability that the commercial producer will buy clean replacement animals. The bulk of the swine population is in the commercial herds. In these herds there has been little effort to eradicate brucellosis. Surveys have indicated that the incidence of brucellosis is relatively low. In most areas, down-the-road testing would not be a logical procedure because of the low incidence of the disease. Several years ago it was agreed that the program should be conducted along the lines of the Market Cattle Testing (MCT) program.

Most States have delayed initiating a MST program. They are waiting for a perfect program. They apparently lack manpower or money to conduct a program. Swine identification is inadequate. Many reasons can be stated for not starting a MST program.

Today we have representatives from three States that are conducting a MST program. They too have the same reasons for not starting a program, yet they do have programs underway. Each will admit the programs are not perfect but each is improving the program as they go along.

These men and States are to be commended for their efforts and their contributions to the knowledge pertinent to conducting a MST program.

[1] Senior Staff Veterinarian, Cattle Diseases, Animal Health Division, Agricultural Research Service, U.S. Department of Agriculture, Hyattsville, Md.

THE MARYLAND MARKET SWINE TESTING PLAN

By John K. Atwell [1]

We began to look earnestly for a good market swine testing (MST) method almost 2 years ago. There were two basic problems to overcome: (1) swine identification and (2) collection of a good quality blood sample for the laboratory examination. We feel that we have developed a method to identify our sows and boars going to slaughter that is adequate in Maryland.

First, we tackled the identification part of the MST program. We wanted a method of identification that would be practical, as easy as possible to apply, easy to read, and one that would not be objectional to the owners, markets, buying station operators, or in the slaughter plants.

We decided on the use of a bangle tag (fig. 1) that was inexpensive. We found it impossible to buy the tags, however, with the numbers and letters shown on this tag. We bought the regular bangle tags, then hand-stamped the State identification code number 51, and the market of buying station letters. S-K is our code for EssKay's buying station. The tag is relatively easy to apply to boars or sows, and the numbers are easily read at slaughter during the "sticking" operation when the blood sample is obtained.

To overcome a problem in applying the tags, one of our employees developed a positive tag holding device. He started with regular hog-ring pliers but welded a spur to the pliers, with a magnet attached to the end of the spur (fig. 2). This magnet holds the tag firmly in place and eliminates the tag falling out of the hog ring pliers when applying the tag.

Ordinarily, livestock inspectors at our 14 markets and two buying stations tag all boars and sows. If the unloading dock is not crowded, the inspector tags the animals in the trucks. However, if the dock is crowded or the inspector has duties elsewhere when the animals are unloaded,

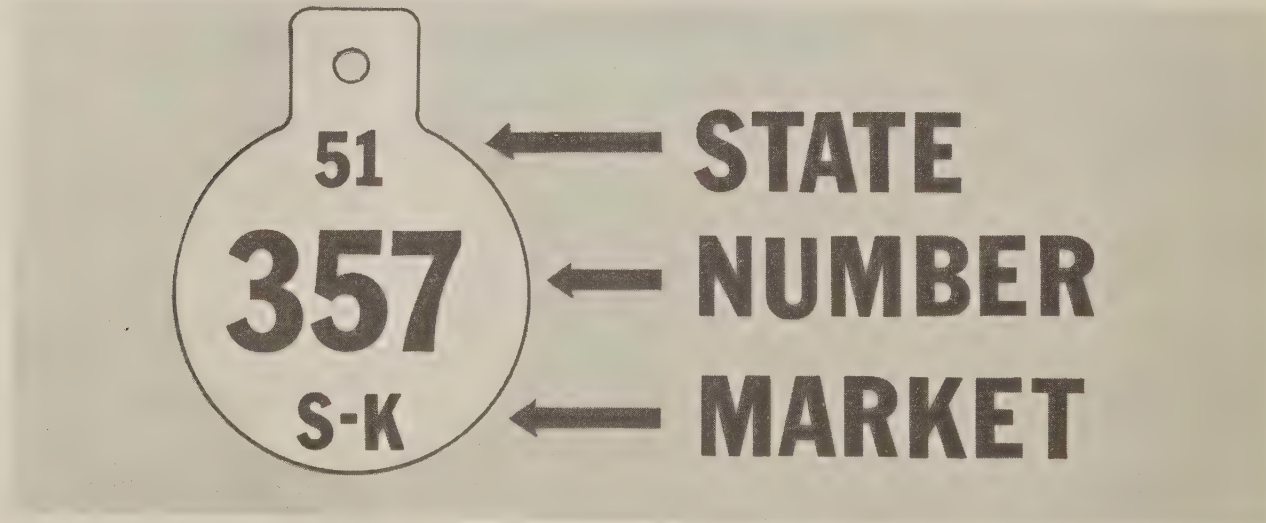


Figure 1.--Bangle tag.

[1] Federal Veterinarian in Charge, Animal Health Division, Agricultural Research Service, U.S. Department of Agriculture, College Park, Md.

the inspector tags them in the pens. All boars and sows are tagged and the name of the owner is recorded regardless of the State of origin.

A record is made of all animals tagged. This record shows the name and address of the owner and the sex and breed of the animal, opposite the tag number. This tag record form is again used in the office to make up the station record forms that are forwarded to the State and Federal offices.

At the end of the day the name of the buyer and the name of the slaughterhouses that have purchased the tag-identified boars and sows are recorded. On the day the photograph for figure 3 was taken, tagged boars and sows were purchased that went to slaughter plants in Maryland, Virginia, Pennsylvania, and even in Chicago.

We feel this method is adequate in Maryland for identifying our boars and sows on the way to market.

Figure 2.--Tag holding device.

Collecting blood samples at the packing plant from these eligible animals for brucellosis testing posed another and different problem. Collecting blood at small plants has been a matter of cooperation. These plants have been very cooperative in that plant personnel collect the blood for us, and we pick up the samples and send them to the laboratory for testing.

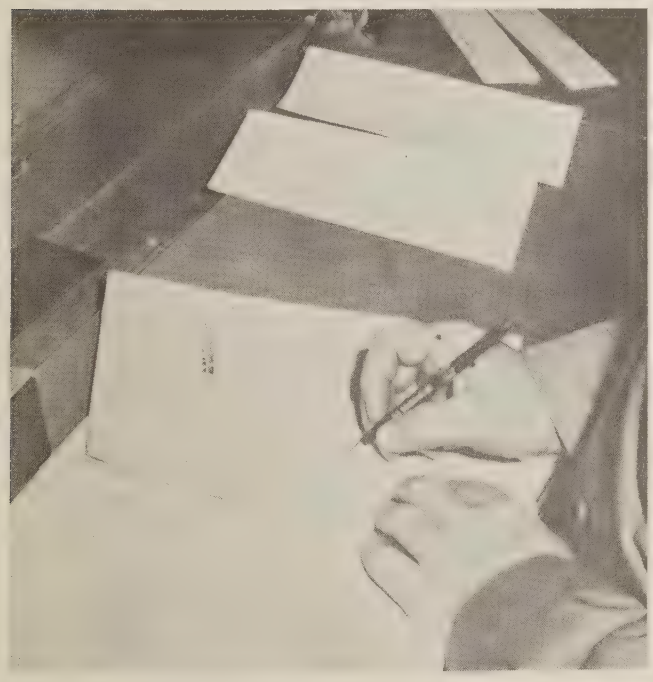


Figure 3.--Recording the name of the buyer and the name of the slaughterhouses that have purchased the tag-identified boars and sows.

Collecting blood at our larger plants posed another problem. These larger plants slaughter hogs at a rate of about 250 per hour. To overcome this problem, a livestock inspector on our staff devised and made a gear (fig. 4).

All parts of the gear are assembled before the collector enters the "sticking" area where the samples are collected. First, is the specially designed hinged plywood carrier or work surface. This surface is 16 inches wide and 12 inches from front to back. The work surface hangs from the operator's neck by lightweight, rust-resistant furnace chains. Other chains go around the operator in a loop to prevent side movement and yet permit free movement of the operator.

The test tubes are prenumbered consecutively with a china marking pencil and then placed in the test tube rack. The rack secured by two spring clips is placed on the left-hand side of the work surface. This rack holds 40 prenumbered tubes--four rows of 10 tubes.

Attached to the work surface on the operator's right-hand side is a clip-board that securely holds the blood-sample record sheet. The record sheet is prenumbered consecutively to match the prenumbered test tubes. When the blood sample has been collected, the bangle tag number is placed opposite the test tube number on the record sheet.

Before putting on this blood collection gear, the operator puts on transparent, lightweight apron and long-sleeved plastic gloves. These items protect the operator's clothing from being soiled by the blood from the stuck animal and protects the operator from possible infection from the animal's blood. Cost for making this specifically designed blood sample collection gear was less than $5.00.

Figure 5 shows an inspector collecting blood samples at the EssKay Plant in Baltimore. This modern plant kills at a rate of about 250 head per hour, or one every 15 second. With his left hand, the inspector collects the blood sample directly from the "stick" wound, free from any contamination. With his right hand, he writes the bangle tag identification number on the record sheet.

After the eligible animals are blood sampled, the test charts are prepared and sent with the samples for laboratory tests. Herds in Maryland are credited with the results of these blood samples.

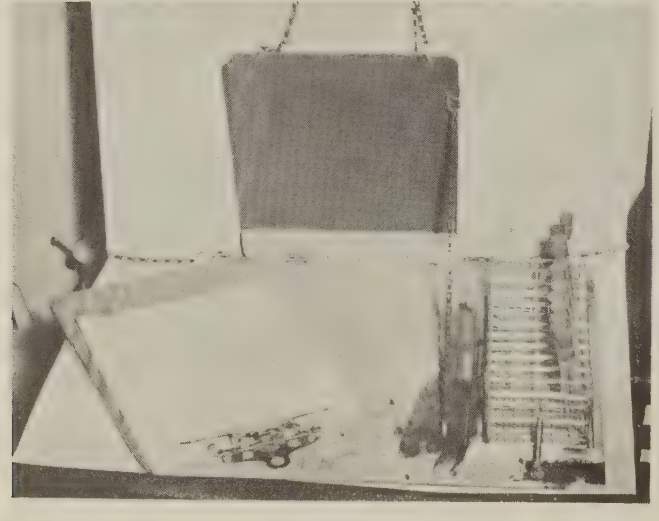


Figure 4.--Blood sample collection gear.

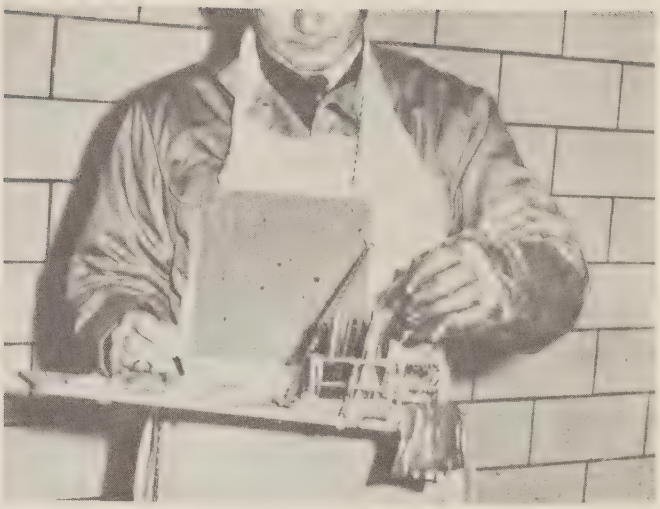


Figure 5.--Collecting blood sample and recording the bangle tag identification number on the record sheet.

Since October 1, 1968, when tagging boars and sows at 14 markets and two buying stations was started, we have identified 2,659 boars and sows with bangle tags. This total represents animals from all of the 23 counties in Maryland.

We have the results on 742 blood samples collected at Maryland slaughter plants. This represents only 28 percent of the animals tagged, but we hope to increase this percentage as soon as agreements can be reached with other States that slaughter Maryland swine. Only a few plants in the State slaughters boars or sows.

To date (February 26, 1969), all samples that have been tested in Maryland have been negative to the brucellosis test. This low incidence of brucellosis in swine indicates to us that when the program has been broadened the State can qualify for Validated Brucellosis-Free status.

THE ILLINOIS MARKET SWINE TESTING PLAN

By Paul Doby[1]

The Illinois Department of Agriculture, with the cooperation of the Oscar Mayer Company plant at Beardstown, Ill., initiated a market swine testing program in April 1968.

During the project, approximately 1,500 sows were slaughtered weekly. The swine were purchased through 18 company buying stations within a 50-mile radius, with additional purchases at terminal stockyards. Swine purchased through the company buying stations were identified by slap tattoo. In purchase of 10 or more animals, this tattoo identified the farm of origin. Small lots were identified by a single tattoo number. Purchases from terminal stockyards were identified only to the order buyer.

The company's officials permitted the Illinois Department of Agriculture employees to collect stick blood and tattoo the carcasses to correspond with the blood sample. Personnel collecting the samples were trained to conduct the card test for brucellosis.

Carcasses of reactor animals were identified in the cooler by the Department tattoo and related to the company tattoo. In this manner the herd of origin of brucellosis reactors were determined.

When the herd of origin was located, a request was made to the owner to test all breeding animals in the herd at State expense. From April through October 1968, company tattoos were not applied to all of the animals because of mechanical problems with an electronic scale. This limited tracebacks on reactors.

At the end of January 1969, 46,062 blood samples had been collected and 212 brucellosis reactors revealed. Of these samples, 14,144 were collected from October 1968 through January 1969, with 39 reactors.

Sixteen of these reactors could be traced back to the farm of origin and involved 14 farms. The remaining 23 reactors were not traceable because of purchases through order buying stations in other States, or loss of tattoos during the slaughter process.

Little evidence of infection was disclosed on any of the farms. One additional reactor was revealed in one of the herds, but that herd was negative on first herd retest following shipment of the reactor. Herd tests are pending on three of the herds.

---

[1] Superintendent, Division of Livestock and Poultry Industry, Illinois Department of Agriculture, Emmerson Bldg., State Fair Grounds, Springfield, Ill.

2001

MARKET SWINE BRUCELLOSIS STUDY FARMBEST PLANTS, DENISON, IOWA

By Don Pietz[1]

This study was a cooperative project between Farmbest Plants, Denison, Iowa; the Animal Disease and Parasite Research Division, National Animal Disease Laboratory, Ames, Iowa; the Animal Health Division, Des Moines, Iowa; and Diagnostic Services, Animal Health Division, National Animal Disease Laboratory, Ames.

The purpose of this study was to (1) evaluate and establish procedures for a market swine brucellosis testing program and (2) to evaluate the card test as a diagnostic procedure for swine brucellosis.

Farmbest Plants was selected for this study because the administrative personnel of this plant had expressed a desire for such a program and a swine identification system was already being utilized in this plant. Animals slaughtered at Farmbest were purchased at their buying stations located in the west-central part of Iowa. All purchased animals were tattooed with a four digit number--two digits for indicating the buying station and two digits for indicating the owner.

Heart clot blood samples were collected (46 weeks) from all sows slaughtered at Farmbest from October 23, 1967, through September 13, 1968. The collection of samples required two operators--one for recording the tattoo of the animal on the plastic cup and the other for squeezing the heart clots from the incised hearts into the cups.

These samples were transported by bus to Diagnostic Services, NADL, Ames, Iowa, where the card and plate agglutination tests were conducted.

There were 18,096 animals tested, representing 4,251 lots or herds. The plate and card test results are recorded in table 1.

The 169 animals in which the plate agglutination test titer was positive at the 1:50 dilution or higher represented 130 herds of swine; whereas the 30 animals that were positive to the card test, represented only nine herds of swine.

The owners of five of these nine herds of swine could not be determined. This was because groups of swine were purchased by Farmbest from commission companies who had purchased animals from many farmers. Each group of animals was identified with a tattoo that identified the commission company, but it was impossible to determine the original owner of each animal.

Three of the four herds in which the owners were identified contained breeding stock and were tested for brucellosis. The serologic results of these herds are recorded in table 2.

---

[1] Diagnostics Reagents, Chief, Diagnostic Services, National Animal Disease Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Ames, Iowa.

TABLE 1.--Results of plate and card test of swine

Plate test titer [1]	Number of animals	Number of animals card positive
+ 200	[2] 6	[3] 5
I 200	[2] 1	[3] 1
+ 100	[2] 6	[3] 4
I 100	[2] 8	[3] 4
+ 50	[2] 148	[3] 12
I 50	467	[3] 2
+ 25	816	[3] 1
I 25	1,817	[3] 1
N 25	14,606	0
QNS	221	0
Total	18,096	30

[1] + = positive; I = incomplete; N = negative; QNS = quantity not sufficient.
[2] Total of 130 herds.
[3] Total of 9 herds.

TABLE 2.--Serologic results of the three herds from which marketed animals were positive to the card test

Standard plate test titer [1]	Number of animals in two infected herds with--		Number of animals in one noninfected herds with--	
	Standard plate test reactions	Card positive results	Standard plate test reactions	Card positive results
+200	19	19	0	0
I 200	3	3	0	0
+100	15	15	[2] 1	0
I 100	5	5	0	0
I 50	5	5	0	0
Total	47	47	1	0
I 50	3	2	0	0
I 25	8	1	3	0
I 25	37	0	2	0
N25	29	1	49	0
Total	77	4	54	0
Grand total	124	51	55	0

[1] + = positive; I = incomplete; N = Negative.
[2] Tissues not yet cultured.

Two of the three herds were infected with brucella as evidenced by (1) both herds having clinical evidence (abortions) of brucellosis, (2) Brucella suis, type 3, was isolated from animals in both herds and (3) the serologic results were indicative of brucellosis. Fifty-one of the 124 animals tested in the two infected herds were positive to the card test. Forty-seven of these animals had titers of positive at the 1:50 dilution or higher on the plate agglutination test. All 47 of these animals were positive to the card test.

The 55 animals in the herd that was considered not to have been infected were negative to the card test; however, one animal had a positive plate agglutination test reaction at the 1:100 dilution. As yet, tissues for culturing purposes have not been obtained from this animal.

When animals were marketed for slaughtering purposes from the two infected herds, another heart clot sample, lymph nodes from the head region (mandibular or suprapharyngeal or both), and the internal iliac lymph nodes were obtained. The tissues were cultured for brucella and the plate agglutination and card tests were conducted on the heart clot serum samples. The culture and serologic results are recorded in table 3.

Brucella was isolated from 49 of the 63 animals slaughtered from the infected herds. Forty-one of these animals had plate agglutination titers of positive at the 1:50 dilution or higher, and all 41 were positive to the card test. Brucella was isolated from eight animals with plate agglutination titers less than positive at the 1:50 dilution, with only one of these animals being positive to the card test. However, all seven infected animals that were negative to the card test had plate agglutination titers of less than positive at the 1:50 dilution.

TABLE 3.--Culture and serologic results on animals slaughtered from infected herds

Standard plate test titer[1]	Animals (49) from which Brucella was isolated		Animals (14) from which Brucella was not isolated	
	Card positive	Card negative	Card positive	Card negative
+ 200	24	0	1	0
I 200	0	0	0	0
+ 100	11	0	1	0
I 100	2	0	3	0
+ 50	4	0	0	0
Total	41	0	5	0
I 50	1	0	0	1
+ 25	0	1	0	0
I 25	0	3	1	3
N 25	0	3	0	4
Total	1	7	1	8
Grand total	42	7	6	8

[1] + = positive; I = incomplete; N = negative.

Brucella was not isolated from 14 of the 63 animals slaughtered from infected herds. Six of these animals were positive to the card test and five of these six animals had plate agglutination titers positive at the 1:50 dilution or higher. All eight animals that were negative to the card test had plate agglutination test titers lower than positive at the 1:50 dilution.

To determine if the card test was missing, brucella-infected herds (23 herds) from which the marketed animals were negative to the card test were tested for brucellosis. The plate test titers on the swine marketed from these herds were as follows:

Plate test titer	Number of herds tested
+ 100	1
+ 50	10
I 50	10
+ 25	2

The owners of only four of these 23 herds reported clinical evidence similar to brucellosis. The clinical evidence reported was as follows:

1. Abortions during the past spring--one herd.
2. Abortions 3 years ago--one herd.
3. Poor conception rate--one herd.
4. One of 36 sows farrowed prematurely--one herd.

There were 767 animals tested in these 23 herds and the serologic results are recorded on table 4.

TABLE 4.--Serologic results of herds (23) from which marketed animals were negative to the card test

Standard plate test titer [1]	Number of animals with card positive	Number of animals with card negative
+ 200	0	0
I 200	0	1
+ 100	0	0
I 100	1	2
+ 50	1	15
Total	2	18
I 50	0	41
+ 25	0	67
I 25	0	105
N 25	0	534
Total	0	747
Grand total	2	765

[1] + = positive; I = incomplete; N = negative.

Two animals, both with plate agglutination test titers of positive at the 1:50 dilution or higher, were positive to the card test. The other 765 animals, including the 18 animals with plate agglutination titers of positive at the 1:50 dilution or higher, were negative to the card test.

The results on culturing tissues from animals slaughtered from these herds are recorded in table 5.

Tissues were cultured from 11 animals from five herds. All animals had plate agglutination titers of incomplete at the 1:50 dilution or higher. These included the two animals that were positive to the card test. Brucella was not isolated from the tissues of these 11 animals.

The results of this study indicate that the card test was an effective method for detecting brucella-infected herds when used on heart clot samples collected at a packing plant. Since the owners could be determined for only four of the nine herds from which marketed animals were positive to the card test, improved procedures are necessary for the identification and traceback of animals. Although 23 herds, from which marketed animals were negative to the card test, were tested for brucellosis, it would be desirable to test more of these herds to determine if the card test is missing brucella-infected herds. In addition, it would be desirable to further evaluate the card test as a diagnostic test for brucellosis by testing and culturing tissues in more infected herds.

TABLE 5.--Culture results on animals slaughtered from herds in which market samples were negative to the card test

Herd	Standard plate test titer [1]	Card test	Culture
A	I 200	N	N
B	I 100	+	N
C	+ 50	+	N
C	+ 50	N	N
C	I 50	N	N
C	I 50	N	N
D	+ 50	N	N
D	I 50	N	N
D	I 50	N	N
D	I 50	N	N
E	+ 50	N	N

[1] + = positive; N = negative; I = incomplete.

DIAGNOSTIC TEST FOR SWINE BRUCELLOSIS

By B. L. Deyoe [1]

Brucella-infected animals usually produce two types of antibodies: IgM and IgG.[2] In contrast, antibodies in serums of noninfected animals that react with Brucella antigen in agglutination tests (heterospecific agglutinins) are always the IgM type. Because of this relationship, tests have been developed that are designed to react only with the IgG antibodies. Some of these supplemental tests are considerably more efficient than others in detecting only IgG antibodies.

Many noninfected swine have heterospecific agglutinins to Brucella in their serum. For a current example: During a recent market swine survey in Iowa 3,269 of 17,875 swine tested (18.3 percent) reacted at the 1:25 dilution or higher using the standard plate agglutination test. Other tests used on the same serums indicated that only 30 of those 3,269 reacting swine (0.9 percent) were potentially infected. Therefore, it has seemed obvious that other tests might be more useful for market swine testing and as a diagnostic test for swine brucellosis than the plate agglutination test.

Consequently, heat inactivation, acidified plate antigen, Card (BBA), Rivanol precipitation-serum agglutination, mercaptoethanol-agglutination, complement fixation, and the standard agglutination (tube and plate) tests have been compared for sensitivity and specificity using serums from infected and noninfected swine.

Results

The number of infected swine[3] whose serum reacted in the various tests was affected by the strain of Brucella suis, the exposure dose, and the length of time infection had existed. Swine exposed to some strains of Br. suis developed serum antibodies sooner and at higher concentrations than swine given a comparable exposure to other strains. Swine exposed to a minimal infective dose of Br. suis developed detectable increases in antibody titer very slowly. Since IgM antibodies are produced earlier in the course of brucellosis than IgG antibodies, the supplemental serologic tests that detect only IgG antibodies cannot always be expected to become positive very soon after infection occurs.

During the first month after experimental exposure, the majority of swine were classified as positive by standard plate agglutination (SPT) and standard tube agglutination (STT) tests. Somewhat fewer swine became positive to the heat inhibition test (56°), Card test, and acidified plate

---

[1] Veterinarian Medical Officer, Animal Disease and Parasite Research Division, Agricultural Research Service, U.S. Department of Agriculture, National Animal Disease Laboratory, Ames, Iowa.

[2] Terms often used synonymously with IgM include: high molecular weight, 19S, macroglobulin, mercaptoethanol-susceptible, and fast sedimenting. Terms often used in place of IgG include: low-molecular weight, 7S, microglobulin, mercaptoethanol-resistant, and slow sedimenting.

[3] Infected swine refers only to swine in which infection was proved, that is, Br. suis was isolated.

antigen (APA) tests during this period. Far fewer swine were classified as positive during the first month using Rivanol, mercaptoethanol, and CF tests.

Probably more similar to the situation one would encounter in a naturally infected herd than the above are the results of test comparisons with swine infected more than 1 month. Of 38 swine infected more than 30 days, 95 percent reacted to SPT and STT tests (at the 1:25 dilution), about 90 percent were positive to 56°, Card, and APA tests, and 67 to 77 percent were positive to Rivanol, mercaptoethanol, and CF tests. If a reaction only at the 1:100 dilution of SPT or STT tests had been considered as positive, all the supplemental tests would have exceeded the standard tests in detecting infected swine. It is likely that little difference among the supplemental tests would be observed in comparisons of tests using naturally infected herds as a source of serums.

It should be noted that none of the tests compared detected all infected swine. This has also been a universal occurrence in studies of naturally infected herds when bacteriologic examination of swine has been a part of the investigation. A typical example of this occurred during the recent market swine survey in Iowa.[4] Mandibular or iliac lymph nodes or both were obtained from 65 swine from two infected herds and cultured. Brucella suis, type 3 was isolated from 50 of the swine. Serums from 49 of the 50 culturally positive swine were tested with SPT, Card, CF, and Rivanol tests, and only 42 were serologically positive.

Other important considerations in evaluating serologic tests are simplicity, time necessary to obtain the result, effect of poor quality serum (swine blood samples are usually badly hemolyzed when received in laboratories), and ease of reading or interpreting results. The SPT, Card, Riv, and APA tests all have an advantage over the other tests in one or more of those factors.

To partly evaluate the specificity of the tests, serums from 55 noninfected swine that originated from three swine herds were tested. All these serums had a + 25 titer and at least one from each herd had a +100 titer on SPT or STT tests. These swine were designated as noninfected only after: (1) Careful investigation of herd histories provided no clinical evidence of brucellosis, (2) 13 of the 55 swine were necropsied, extensively cultured, and Brucella was not isolated, and (3) another 13 were exposed to Br. suis and proved to be susceptible. Only 3, 2, 2, and 1 noninfected swine were positive to 56°, Card, APA (pH 4.0), and Rivanol tests, respectively. None were positive to mercaptoethanol and CF tests. Thirty-two of the 55 swine were classified as positive by a 65° heat inactivation test recommended for use with cattle serums. In about 60 percent of noninfected swine the SPT titer exceeds the STT titer by one dilution or more.

A more extensive evaluation of the effects of heat and acidification on tests was conducted by comparative testing of whole serums and serum fractions that originated from infected swine. The samples were tested with the STT, mercaptoethanol, 56°, and SPT tests and with plate test antigen buffered at pH 3.6. The latter is analogous to Card and APA tests.

Apparently the reaction of both IgM and IgG Brucella agglutinins in swine serum is significantly inhibited by heat and acidification. The SPT and STT procedures detect IgM agglutinins equally well, but the SPT procedure does not detect IgG agglutinins efficiently. The latter observation provides an explanation for the occasional occurrence of infected swine that fail to react with the SPT, but are positive to STT, Card, and APA tests.

---

[4] Report by D. E. Pietz earlier in the program.

Conclusions

All the established tests would be adequate for herd tests. No available test would be likely to detect all the infected swine in an infected herd.

The 56°, Card, and APA tests are all more accurate diagnostic methods than the standard agglutination tests. Among these three tests, the Card and APA tests are preferable because the 56° test requires longer to obtain results, is often difficult to read, and is not useful with very poor quality serums.

The Rivanol, mercaptoethanol, and CF tests might not be sensitive enough for use as screening tests, but could be used to confirm positive results with other tests. Among these three tests, the Rivanol test is probably preferable because the CF test is more complex and the mercaptoethanol test requires longer to obtain results, is sometimes difficult to read, and is not useful with very poor quality serums.

The SPT test, which is used predominantly or exclusively in most States as the diagnostic test for swine brucellosis, is the most inaccurate test available for that purpose.

Use of the SPT as a diagnostic test for swine brucellosis should be "phased out" as soon as possible. The most acceptable replacements appear to be APA tests or the Card test.

REPORT OF THE SUBCOMMITTEE ON RESEARCH

By C. A. Manthei,[1] Chairman

Research on bovine brucellosis in the United States has been rather limited during the past 2 years. The exceptions are current studies to improve the specificity of serological tests used for diagnosing brucellosis in the individual and of the milk ring test used for locating infected dairy herds.

This report will be limited to a presentation of published information about the adjuvant vaccine prepared from killed Brucella abortus, Strain 45/20 because some segments of the cattle industry are interested in using this product to control bovine brucellosis. There are three such adjuvant vaccines being produced commercially at this time and are identified as Glaxo 45/20, Duphavac N.A., and Neobrucel.

In a paper recently published by McDiarmid,[2] the author compared Compton killed 45/20 adjuvant vaccine prepared by him, Glaxo killed 45/20 adjuvant vaccine, and Strain 19 living vaccine in four separate experiments with cattle. The data show that two doses of Compton 45/20 vaccine and one dose of Strain 19 vaccine produced comparable, as well as highly significant, protection against virulent Br. abortus. However, according to the author, the severity of local reactions produced by the Falba and liquid paraffin adjuvant in Compton 45/20 vaccine makes it unacceptable for use under field conditions. The Glaxo 45/20 vaccine, which was prepared with an adjuvant of water-in-oil or oil-in-water, did not produce any significant degree of immunity in cattle to virulent Br. abortus.

Morgan and McDiarmid[3] recently published a review on adjuvants vaccines prepared from killed Br. abortus, Strain 45/20. Effectiveness of this vaccine as judged by local reaction, antibody response, and resultant immunity depends essentially on the nature of the adjuvant. Local reaction generally is not unacceptable with vaccines now available and their effect on the serum agglutination test is much less than that produced with Strain 19 vaccine, whereas the effect of Strain 45/20 vaccines on the complement fixation test is much greater. In cattle experimentally exposed to virulent Br. abortus, the degree of protection afforded after two injections of Strain 45/20 adjuvant vaccines is less than that induced with one injection of Strain 19 vaccine. Under certain circumstances, the strategic use of Strain 45/20 vaccines can play a useful role in a vaccination program for control of bovine brucellosis. The authors state that use of Strain 45/20 vaccines in noninfected cattle, which are at risk of exposure to infection, can play a useful role in controlling brucellosis, but only in conjunction with (a) hygienic measures to limit and reduce exposure and (b) periodic blood testing of the herd and removal of infected animals.

---

[1] Director, National Animal Disease Laboratory, Agricultural Research Service, U.S. Department of Agriculture, Ames, Iowa. Other members of the Subcommittee were Robert K. Anderson, I. H. Borts, Norman B. McCullough, and S. H. McNutt.

[2] McDiarmid, A. Vaccination against brucellosis with particular reference to the use of killed adjuvant vaccines prepared from the non-agglutinogenic Strain 45/20 Brucella abortus. British Vet. Assoc. Symposium 1966. In Some Diseases of Animals Communicable to Man, pp. 281-293; 1968.

[3] Morgan, W. J. Brinley, and McDiarmid, A. Adjuvant vaccines prepared from killed Brucella abortus Strain 45/20. Vet. Rec. 83: 184-189, 1968.

deKeyser and Florent[4] reported the results of a comparative study of serologic reactions and immunity in calves vaccinated with Strain 19 and two nonagglutinogenic vaccines. Neither of Strain 45/20 vaccines were satisfactory because Duphavac N.A. stimulated antibodies easily demonstrated by the complement fixation and Coombs tests and Neobrucel did not induce a significantly detectable immunity. Renoux [5] likewise reported that a killed 45/20 adjuvant vaccine conferred little or no immunity in cattle to virulent Br. abortus. The immunologic results of these experiments were assessed on culture of post-mortem material a short time after the vaccinated cattle were artifically exposed to virulent Br. abortus; whereas results reported by other investigators were assessed at termination of the first pregnancy after vaccination.

Powell, Hendricks, and Roebuck[6] reported the immunity induced in calves given two injections of Duphavac N.A. at 6 and 9 months of age was comparable with that induced in calves given Strain 19 at 3 or 6 months of age. Very little or no immunity was induced in calves given two injections of Duphavac N.A. at 3 and 6 months of age or in calves given a single injection at 6 months of age.

Roerink[7] published a comprehensive thesis on killed 45/20 adjuvant vaccine (Duphavac N.A.) but did not report results of controlled experiment studies about the immunologic response in cattle.

The following is a quote from a paper published by Cunningham and O'Reilly:[8] "Killed 45/20 adjuvant vaccines are not completely nonagglutinogenic. There is a low level response to the first injection of vaccine and a slightly higher response to the second injection. The degree of response increases from calfhood to maturity but seldom reaches doubtful or positive levels. Vaccination of cows with 45/20 adjuvant vaccines did not produce agglutinins in milk." They used both Glaxo and Duphavac 45/20 vaccines. All calves vaccinated with Strain 19 vaccine at 3 to 6 months of age were negative (< 30 I.U.) $4\frac{1}{2}$ months after vaccination.

Cunningham[9] reported that injection of cattle with 45/20 vaccine, after the animals had been vaccinated with Strain 19 or had become infected, resulted in a sharp rise in antibody titers to the Coombs and complement fixation tests.

---

[4] deKeyser, J., and Florent, A. Comparative study of the serological reactions and immunity in calves vaccinated against Brucellosis with strain 19 and non-agglutinogenic vaccines. Vlaams Dierg. Tidjs. 36: 175-190.

[5] Renoux, G., Nicolas, J. A., Imbert, R., and Quechon, M. Immunisation des Génisses Contre l'Infection par Brucella abortus. Comparaison de 4 Vaccins. Rev. Immunol 28; 121. 1964.

[6] Powell, H. S., Hendricks, J. B., and Rasbuck, D. E.: Paper presented to U.S. Livestock Sanitary Association, October 1966.

[7] Raerink, J. H. G.: Development of a Non-agglutinogenic Killed Brucella abortus vaccine and its Applicability in the Control of Bovine Brucellosis. Thesis 1966. Rijksuniversitect, Utrecht.

[8] Cunningham, B., and O'Reilly, D. J. Brucella abortus vaccines. Agglutinin responses in blood serum and milk following vaccination of cattle of various ages with live S.19 and killed 45/20 adjuvant Brucella abortus vaccines. Vet. Rec. 82: 678. 1968.

[9] Cunningham, B. Serological responses in cattle following vaccination with S.19 and killed Brucella 45/20 adjuvant vaccine. Vet. Rec. 82: 7-10. 1968.

Summary of Known and Unknown Information about Killed 45/20 Adjuvant Vaccines.

Known:

1. The adjuvant appears to be the most critical factor in obtaining consistent immunologic results with killed 45/20 adjuvant vaccines.

2. Two doses of these vaccines must be given at a rather exacting interval to produce maximum immunity to infection.

3. Double vaccination with killed 45/20 adjuvant vaccines occasionally produce immunity in cattle comparable to that produced with Strain 19 vaccine but experimental results have been inconsistent.

4. Killed 45/20 adjuvant vaccines stimulate little or no agglutinin response in cattle but stimulate significant levels of complement fixing antibodies.

Unknown:

1. What is the duration of immunity produced by two doses of killed 45/20 adjuvant vaccines?

2. What is the booster effect of annual revaccination on immunologic and antibody responses?

3. Are there factors, other than adjuvants, responsible for inconsistent immunologic responses in cattle?

4. What is the feasibility of double vaccination and annual revaccination with killed 45/20 vaccines, particularly since it has not been possible to vaccinate more than 56 percent of the eligible heifer calves or to vaccinate them at the most desirable age with a single dose of Strain 19 vaccine in this country?

REPORT OF SUBCOMMITTEE ON PUBLIC HEALTH

By James H. Steele[1], Chairman

Summary

A total of 231 human cases of brucellosis were reported in 1968, a decrease of 17 from the 248 cases reported by this time last year (fig. 1). Thirty-four States reported one or more cases in 1968, with 6 States recording 71 percent of the cases.

Brucellosis case surveillance reports on 187 cases (81 percent) were received by the Zoonoses Investigations Unit, National Communicable Disease Center (NCDC). Two cases had both the onset and a recrudescence in 1968 and were counted as a total of four cases.

Three additional cases were caused by infection with an organism for which the name Brucella canis has been proposed, but are not included in the figures of this report.

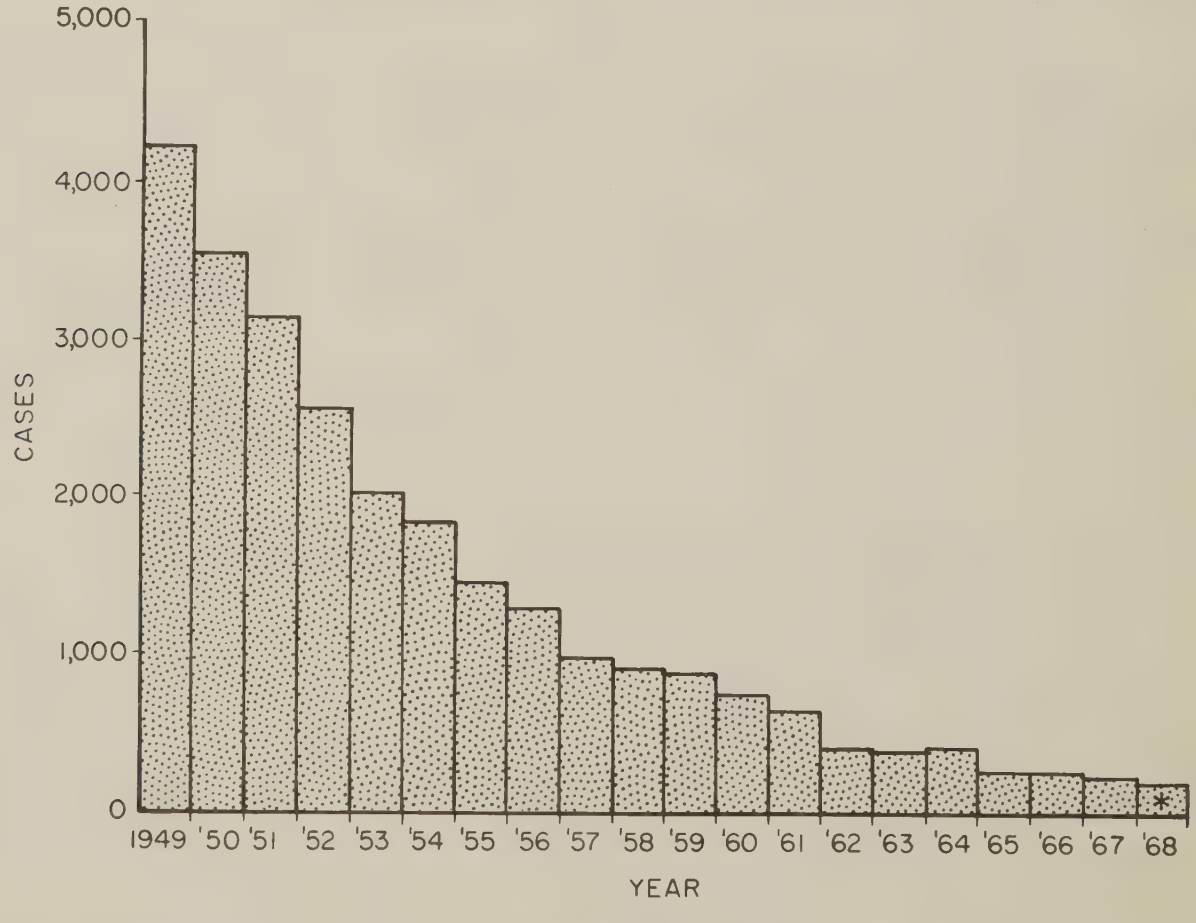


Figure 1.--Report human brucellosis in the United States, 1949-1968 (provisional data). Source: Case reports submitted to NCDC Zoonoses Investigations Unit, Morbidity and Mortality Weekly Report.

[1]Chief, Veterinary Public Health Section, Epidemiology Program, National Communicable Disease Center, Health Services and Mental Health Administration, U.S. Department of Health, Education, and Welfare, Atlanta, Ga.

Geographic Distribution

Table I lists the number of 1968 cases reported by each state. Data for 1967, 1968, and a 5-year average (1963–1967) are compared for each State. Five States reporting cases in 1967 did not report cases in 1968; three States reporting cases in 1968 reported no cases the previous year.

TABLE I
REPORTED HUMAN BRUCELLOSIS

STATE	FIVE YEAR MEAN 1963-1967	1968†	COMPARISON OF NUMBERS OF CASES REPORTED IN 1968 WITH 1967	CERTIFICATION STATUS (CATTLE)	VALIDATION STATUS (SWINE)
Alabama	3.0	1	−1	Modified-Certified	
Alaska	1.2	2	−4	Modified-Certified	
Arizona	2.0	0	0	Modified-Certified	
Arkansas	6.2	1	−2	Modified-Certified	
California	18.6	21	−2	Modified-Certified	
Colorado	0.8	1	−1	Modified-Certified	
Connecticut	0.8	1	−1	Certified Brucellosis-Free	
Delaware	0.0	0	0	Modified-Certified	
Florida	4.0	2	−2		
Georgia	11.2	12	+6	Modified-Certified	
Hawaii	1.4	0	−3		
Idaho	1.6	0	−1	Modified-Certified	
Illinois	18.4	5	−4	Modified-Certified	
Indiana	2.4	2	−1	Modified-Certified	
Iowa	85.2	29	−9	Modified-Certified	
Kansas	5.6	2	+2	Modified-Certified	
Kentucky	3.2	0	−4	Modified-Certified	
Louisiana	6.4	6	+2		
Maine	0.4	1	+1	Certified Brucellosis-Free	
Maryland	0.8	0	−2	Certified Brucellosis-Free	
Massachusetts	2.2	4	+3	Certified Brucellosis-Free	
Michigan	4.2	1	−6	Certified Brucellosis-Free	
Minnesota	10.6	4	−8	Modified-Certified	
Mississippi	5.2	3	−3		
Missouri	10.4	2	−6	Modified-Certified	
Montana	0.4	1	0	Modified-Certified	
Nebraska	8.4	3	−5		
Nevada	0.0	0	0	Certified Brucellosis-Free	Validated Brucellosis-Free
New Hampshire	0.0	0	0	Certified Brucellosis-Free	
New Jersey	1.4	5	+2	Certified Brucellosis-Free	
New Mexico	1.0	1	−1	Modified-Certified	
New York	5.0	5	+1	Certified Brucellosis-Free	
North Carolina	3.6	1	−1	Modified-Certified	
North Dakota	1.6	10	+8	Modified-Certified	
Ohio	1.8	0	0	Modified-Certified	
Oklahoma	8.4	3	−4		
Oregon	2.0	0	−3	Modified-Certified	
Pennsylvania	4.0	2	−7	Modified-Certified	
Rhode Island	0.2	0	0	Certified Brucellosis-Free	
South Carolina	0.0	0	0	Modified-Certified	
South Dakota	9.8	5	+3		
Tennessee	7.8	15*	+6	Modified-Certified	
Texas	21.2	12	−17		
Utah	6.4	1	+1	Certified Brucellosis-Free	Validated Brucellosis-Free
Vermont	0.4	0	0	Certified Brucellosis-Free	Validated Brucellosis-Free
Virginia	20.6	64*	+35	Modified-Certified	
Washington	0.6	0	0	Certified Brucellosis-Free	
West Virginia	0.8	0	0	Modified-Certified	
Wisconsin	7.8	3	+1	Certified Brucellosis-Free	
Wyoming	0.4	0	0	Modified-Certified	
TOTALS	6.4	231	−27		

†Provisional Data

*One case with onset and recrudescence in 1968 counted as two cases.

Sources: Case Reports submitted to the NCDC Zoonoses Investigations Unit; *Morbidity and Mortality Weekly Report*; United States Department of Agriculture, Agricultural Research Service, Animal Health Division.

Two States reported the same number of cases, 13 States reported an increased number of cases, and the number of cases declined in 24 States. California, Georgia, Iowa, North Dakota, Tennessee, Texas, and Virginia reported 71 percent of the cases in 1968. The greatest increase in cases occurred in Virginia, with the largest decrease in Texas.

Temporal Distribution

The seasonal trend of the 1968 cases, by month of onset, is shown in figure 2. More cases occurred in June than in any other month with the fewest cases having their onset in November. This distribution is similar to that observed in 1967 when more cases occurred in June than any other month, but in 1967 the fewest cases occurred in February.

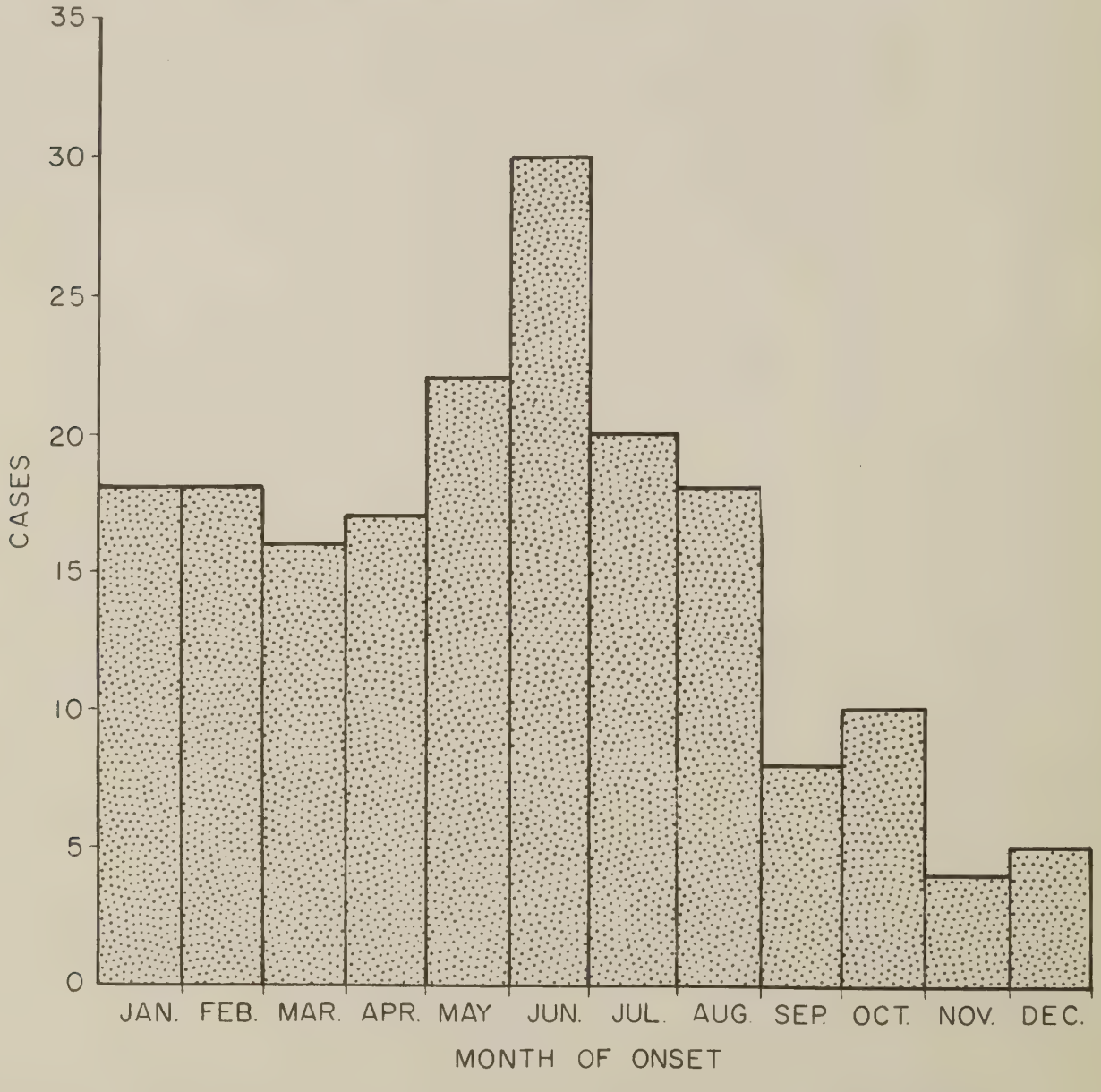


Figure 2.--Seasonal trend of reported human brucellosis by date of onset (if month of onset was not given, month of positive laboratory results or the month reported was used. Out of 187 reports, 1 was completely, unknown and is not reflected in the figure), 1968 (provisional data). Source: Case reports submitted to the NCDC Zoonoses Investigations Unit.

Age and Sex Distribution

Brucellosis affected predominantly young and middle-aged individuals (table 2). Males accounted for 158 of the 187 cases (85 percent) and 131 of the 158 males (83 percent) were between 20 and 60 years of age.

TABLE II
CASES OF HUMAN BRUCELLOSIS BY AGE AND SEX – 1968*

AGE GROUP (Years)	SEX		TOTAL	PERCENT OF TOTAL
	MALE	FEMALE		
0-4	1	0	1	0.5
5-9	2	2	4	2.1
10-14	7	0	7	3.7
15-19	6	1	7	3.7
20-24	21	4	25	13.4
25-29	29	2	31	16.6
30-34	18	5	23	12.3
35-39	21	3	24	12.8
40-44	9	5	14	7.5
45-49	15	3	18	9.6
50-54	8	0	8	4.3
55-59	10	1	11	5.9
60-64	3	0	3	1.6
65+	4	1	5	2.7
Unknown	4	2	6	3.2
Total	158	29	187	99.9

*Provisional Data
Source: Case reports submitted to the NCDC Zoonoses Investigations Unit.

Occupational Distribution

Persons associated with packinghouses accounted for 105 of the 187 cases investigated (56 percent). In 73 of the 105 workers (70 percent), swine were the most probable source of infection, while only 9 of these 105 people (9 percent) were exposed to cattle as the single most probable source. (Tables 3 and 4.)

Farmers associated with livestock made up 17 of the 187 cases (9 percent). Nine of these infections (53 percent) were related solely to exposure to cattle.

Only four of the 187 cases (2 percent) involved veterinarians. Two of these cases were recrudescences.

Sources of Infection

Recrudescence of brucellosis (table 3) was noted in 14 of the 187 reports (8 percent).

In 16 of the 187 cases (9 percent), the most probable source of infection was a dairy product that originated outside of the United States. Thirteen of these cases were associated with Mexican cheese or Mexican raw milk products and three cases were infected from raw milk or sheep cheese in Italy.

TABLE III
HUMAN BRUCELLOSIS CASES – 1968*
OCCUPATION AND MOST PROBABLE SOURCE OF INFECTION

CLASSIFICATION	OCCUPATION	MOST PROBABLE SOURCE OF INFECTION									
		Swine	Cattle	Cattle and Swine	Sheep and Goat	Cheese	Raw Milk	Accident or Laboratory Acquired	Other and Unknown	Total	Recrudescence
Animal Industry	Packing House	73	9	13	1				9	105	5
	Rendering Plant			2					1	3	1
	Veterinarian		1	2				1		4	2
Farmer	Livestock	4	8	2	1			1		16	
	Dairy		1							1	
Other Categories	Housewife		1			5°	5		2	13	3
	Student/Child	1				2°	5	1	3	12	
	Other	3	5	2		3	4	4	6	27	3
	Unknown						1		5	6	
Total		81	25	21	2	10	15	7	26	187	14

*Provisional Date

°One case also associated with raw milk as next most probable source

Source: Case reports submitted to the NCDC Zoonoses Investigations Unit.

TABLE IV
HUMAN BRUCELLOSIS CASES IN PACKINGHOUSE WORKERS – 1959-1968

YEAR	TOTAL CASES REVIEWED	CASES IN PACKING-HOUSE WORKERS	PERCENT OF TOTAL
1959	658	155	24
1960	555	221	40
1961	413	174	42
1962	276	115	42
1963	257	122	47
1964	322	139	43
1965	207	89	43
1966	224	93	42
1967	209	108	52
1968*	187	105	56

*Provisional Data

Source: Case reports submitted to the NCDC Zoonoses Investigations Unit

Of the 187 cases, 81 (43 percent) listed swine as the most likely source, 25 (13 percent) were associated with cattle only, 21 (11 percent) noted cattle and swine, and 25 (13 percent) were from dairy products.

Major Symptoms

In the 169 cases where symptoms were recorded, fever, chills, and malaise predominated (table 5).

TABLE V
SYMPTOMS OF HUMAN BRUCELLOSIS CASES° – 1968*

SYMPTOM	NUMBER	PERCENT OF TOTAL
Fever	151	89.3
Chills	122	72.2
Malaise	120	71.0
Weakness	113	66.9
Body Ache	111	65.7
Sweating	110	65.1
Headache	84	49.7
Anorexia	64	37.9
Weight Loss	59	34.9

°169 case reports where 1 or more symptoms were recorded.
*Provisional Data.
Source: Case reports submitted to the NCDC Zoonoses Investigations Unit.

Blood Culture

Of 75 blood cultures done, at least 42 (56 percent) were positive for a Brucella species. The distribution of Br. abortus and Br. suis isolates, 17 percent and 48 percent respectively, is on the same order as the distribution of cattle and swine as sources of infection.

Brucellosis in Human Medicine

In recent years, the incidence of human brucellosis in the United States has decreased significantly. The classical syndrome is now readily identifiable, and effective treatment is well established. However, the overall clinical recognition of brucellosis is becoming more difficult because of atypical cases.

Many of these atypical cases involve localized infections where diagnosis is quite difficult. Such cases may show recurrent systemic manifestations. These cases are often chronic, and the agglutination titers are generally low or absent and blood cultures are negative. Positive diagnosis can only be made by isolating Brucella from the involved tissue. The most common sites of localization appear to be the skeleton, spleen, genitourinary tract, soft tissues, and lungs (1).

Brucellosis still should be suspected in any patient with an ill-defined febrile illness and whose occupation brings him into contact with livestock, particularly swine and cattle. Today, the ingestion of dairy products is not of great concern in brucellosis epidemiology in this country

because of widespread pasteurization practices. However, history of foreign travel or consumption of foreign milk products should be considered in an epidemiologic investigation.

Brucellosis is primarily an occupational disease. It is a disease of animals that is transmissible to man and until the disease is eradicated from animals, cases in man will continue to occur (2).

Unusual Cases of Human Brucellosis

Ulcers of the Skin

Christianson, Pankey, and Applewhite (3) described a patient with ulcers of the skin caused by Br. suis. The patient apparently acquired the infection from contamination of a day-old knee abrasion with blood of a deer he had killed. Indolent ulcers developed on the knee 3 weeks later. Antibiotic therapy was ineffective and a biopsy revealed a nonspecific granulomatous reaction. A skin test for Brucella was positive while other skin tests for blastomycosis, coccidioidomycosis, histoplasmosis, and tuberculosis were negative. Br. suis in pure culture was isolated from biopsy material. After a 6-week course of tetracycline, the patient completely recovered.

Thrombocytopenia and Meningitis with Brucella Infection

Halpern and Wolf (4) published a case report that exemplified a unique host-parasite relationship. The patient was first examined because of recurrent epistaxis and bleeding gums. Thrombocytopenia was noted upon admission and, in the course of hospitalization and observation, Br. abortus was isolated from the blood 12 times and from several bone marrow specimens. Despite the presence of the pathogen, there were no systemic symptoms. After corticosteroid therapy, the platelet count returned to normal. Blood cultures became negative, even though no specific antibiotic therapy was given. The patient was subsequently hospitalized with meningitis. Blood cultures were positive for Br. abortus, but thrombocytopenia did not recur. The patient recovered following antibiotic treatment.

Thrombocytopenia is not unheard of in brucellosis, and meningitis is not uncommon. In this case the lack of typical symptoms associated with the bacteremia was noteworthy. The authors underscored the fact that "the manifestations of disease reflect not so much the pathogen as they do the response of the host in its relationship with the pathogen."

TABLE VI
BLOOD CULTURE RESULTS FROM HUMAN BRUCELLOSIS CASES – 1968*

SPECIES ISOLATED	NUMBER	PERCENT OF TOTAL
Br. suis	20	26.7
Br. abortus	7	9.3
Br. melitensis	6	8.0
Br. suis & Br. melitensis	1	1.3
Species Unknown	8	10.7
Results Unknown	12	16.0
Negative	21	28.0
TOTAL CULTURED	75	100.0

*Provisional Data
Source: Case reports submitted to the NCDC Zoonoses Investigations Unit.

Brucellosis Outbreaks - 1968

Foodborne Outbreak

On September 28, 1968, a 28-year-old woman was hospitalized in California with nausea, vomiting, profuse sweating, chills, general malaise, severe weakness, and fever. Br. melitensis was recovered from her blood. There was no history of having been out of the country recently or having consumed raw milk, but the woman had eaten some cheese at the home of neighbors a few weeks before the onset of illness. An epidemiologic investigation by the California Department of Public Health revealed that several cheeses had been purchased by the neighbor in Mexico in July 1968. Further inquiry established that a total of 12 persons from the index case's family and neighbor's family had probably eaten of the same cheese. Only one other person, a 15-year-old boy of the neighbor's family, had been ill about the same time as the index case. His illness consisted of vague muscle and limb pains, malaise, and fever. A tentative diagnosis of hepatitis had been made. Subsequently, blood specimens were drawn from the members of both families and examined for Brucella agglutinins. In addition to the index case, four members of the neighbor's family had elevated Brucella titers, one of whom was the 15-year-old boy. These people were treated with tetracyclines, and, except for the index case, who was convalescing, all were asymptomatic at last report (5).

Packinghouse Outbreak

Late in July, three cases of brucellosis in a large meat packing plant were reported to the Georgia Health Department. An investigation uncovered a total of 20 employees, including the index cases, with titers, nine of whom showed clinical symptoms. Br. abortus was isolated from one case and Br. suis, obtained from the blood of five others.

During the investigation it was found that 11 clinically asymptomatic employees had titers against leptospirosis. Studies of the incidence of brucellosis and leptospirosis in the swine processed in this plant are now in progress (6).

Human Brucellosis in India

Mathur (7) described a study of brucellosis in India based on 53 Brucella isolates from human cases, and 162 Brucella cultures from cows, buffaloes, goats, and sheep. He stated that a human patient was sick for an average of 4 months before the condition was diagnosed as brucellosis. The syndrome was most often mistaken for typhoid, but malaria, rheumatism, orchitis, and hepatitis were also diagnosed.

The 53 cultures from human cases were all identified as Br. melitensis. Milk from 15,568 goats yielded 50 strains of Brucella and from 14,937 milk samples from sheep, 38 strains of Brucella were isolated. Thirty-nine of the goat strains and 32 of the sheep strains were Br. melitensis. Seventy-four strains of Br. abortus were isolated from cows and buffaloes on organized farms. No isolates were made from cows and buffaloes in villages. From the data it was evident that the source of human Brucella infection in India was goats and sheep. Further epidemiologic investigations revealed that infections in sheepherds were caused by close contact with vaginal discharges from animals which had aborted because of Br. melitensis infection. However, the main source of human brucellosis in cities in India was unboiled or improperly pasteurized milk containing goat or sheep milk or cream.

Brucella Canis Infection in Man

Three human infections caused by the organism of infectious canine abortion, widely referred to as Brucella canis, were reported in 1968.

One infection occurred in an animal caretaker working with 20 adult dogs known to be infected with Br. canis. His duties involved routine daily care of the dog colony, including the pre- and post-parturient care of the females. This case was found during routine serological monitoring procedures. Other personnel more intimately involved over a longer period of time at these facilities continue to be serologically negative (8).

Two laboratory technicians working with Br. canis were infected by oral exposure during pipetting procedures in separate incidents in the same laboratory. Both individuals developed agglutinins that persisted for several months. Both received tetracycline therapy, but one of them began treatment within 24 hours of exposure and did not develop clinical illness. The other worker went untreated until onset 4 to 5 weeks after exposure. The patient exhibited malaise, posterior cervical lymph node swelling accompanied by pain, persistent low grade fever, and headache. Br. canis was isolated from her blood about 2 weeks after onset. All workers in this laboratory, including the two cases, were later skin tested with a commercial Brucella antigen. From the results, it would appear that persons infected with Br. canis become sensitive to a Brucella skin test, but the reactions may not be as marked as in those persons infected with Br. abortus (9).

Brucellosis in Veterinary Medicine

SEROLOGICAL CROSS-REACTIONS

Nicoletti and Holmes (10) attempted to produce heterospecific, or cross-reacting, agglutinins for Brucella in cattle by immunizing animals with hemorrhagic septicemia bacterins in an effort to clarify conflicting reports on the cross-reactions of Brucella and Pasteurella. No significant cross-reactions were found. The authors did suggest that under field conditions unknown factors may be present that result in apparent cross-reactions.

While no cross-reacting agglutinins to Pasteurella were demonstrated in the bovine study, it has been established that the agglutination test is not specific for the diagnosis of human brucellosis. Common antigenic reactions to Brucella antigen have been associated with Franciella (Pasteurella) tularensis, Salmonella typhosa, Shigella flexerni (11), and Vibrio cholerae (12). In most cases, the cross-agglutination is low in titer and seldom leads to confusion when considered in light of the epidemiologic information and other laboratory data. Agglutination of Brucella antigen with antibodies to Vibrio cholerae, however, may be significant in some cases (13). The identity of the antigen common to the Brucella and Vibrio species has not been definitely established (12). Studies are being conducted at the National Communicable Disease Center to determine the relationship.

CARBOLIC ACID AND BRUCELLA TITERS IN CATTLE

Ellis, Beak, and Ruhland (14) conducted a study to prove or disprove the belief of some cattle dealers that carbolic acid administered to reactor cattle will lower the titers within 2 months. In this experiment, carbolic acid was given orally and intravenously to cattle with natural or vaccine-induced titers. The results of the study supported the conclusions of other investigators that carbolic acid is ineffective in reducing positive Brucella titers.

Late in 1967 the Agricultural Department in Great Britain limited the use of Br. abortus Strain-19 vaccine in cattle to those animals under the Free Calf Vaccination Service. In addition, Strain 45/20 dead adjuvant vaccine is allowed for use only in over-age cattle, that is, cattle beyond the age of 180 days, in certain limited circumstances where (1) a herd is uninfected or is of unknown status, but appears to be free of infection; (2) heifers of unknown vaccination status are introduced into a situation of possible risks; (3) light infection may be present; or (4) it is indicated to reduce the danger of abortion in a known infected herd. This order represented another substantial step forward in Britain's long-term program for brucellosis eradication (15).

The main impetus for the British order was the prevalence of vaccine-induced reactors that have been encountered in diagnostic testing. This has made eradication by the test and slaughter method impractical (15). The problems encountered in England were well pointed out by Nagy, Hignett, and Ironside (16) who reported on a study of an adult-vaccinated, Brucella-infected herd. The titers caused by natural infection and those caused by vaccination overlapped, making accurate assessment of the Brucella status of the herd extremely difficult. The authors lamented that these titers "were a matter of concern and a source of anxiety during eradication."

The problem of persistent vaccine titer, as witnessed dramatically in Great Britain, has long been recognized in the United States. The "masking effect" of residual vaccination titers also has tended to leave suspects in a herd that are actually infected. This commonly results in the continuation of infection in "problem herds" in this country (17). The recent lowering of the age limits recommended for calfhood vaccination should substantially reduce these two problems in the future.

Another problem associated with brucellosis vaccination in the eradication program in this country is receiving more attention. The widespread use of Strain-19 vaccine has raised concern about the possible permanent establishment of this organism in some vaccinated animals (18). This problem is of particular importance to those States that are in the final stages of eradication (19). A number of reports have noted the isolation of Strain-19-like organisms from vaccinated cattle in the United States (17, 18, 19, 20). Aldrick (21) has reported that Strain-19 isolates have been received at the Regional WHO Brucellosis Center in Melbourne from Australia and Papua-New Guinea.

The problems of persistent vaccination titers, the masking effect of vaccination titers, and the establishment of Strain-19 organisms in vaccinated animals support the plans of animal health authorities in the United States to eliminate vaccination of cattle as soon as it is feasible to do so (17).

Equine Brucellosis

Equine brucellosis is considered to be uncommon, especially with the decreasing exposure to infected cattle (17). The disease has been associated with equine abortion, fistulous withers, bursitis, and tenosynovitis. Some equine authorities believe that brucellosis is a significant, largely unrecognized, disease in horses, particularly in certain cases of chronic lameness. Hutchins and Lepherd (22) conducted a serological survey for Brucella in Australian horses to determine possible relationships. Of over 1400 sera studied, less than 2 percent had significant titers to Br. abortus. From cases of fistulous withers at a veterinary clinic, 74 percent were serologically positive which was comparable to a 71 percent prevalance noted in another study. Twenty-three percent of the horses on known infected dairy farms had Brucella agglutinins. While 1.0 percent of the unthrifty horses or those affected with other disease entities were positive, 5 percent of lame horses showed antibody levels for Br. abortus. Agglutinins were found in only 0.2 percent of horses which were not lame.

Canine Brucellosis

The increased concern about canine brucellosis in recent years has emphasized the need to appraise the status and importance of this disease in dogs. The epizootiology of canine brucellosis is significant from veterinary and public health viewpoints. A number of natural infections in dogs have been documented (23). Clegg and Rorrison (24) recently recorded an unusual case of polyarthritis in a dog from which Br. abortus was isolated. The danger of canine-to-human transmission was pointed out by Nicholetti, Quin, and Minor (25). Many of the reported cases of canine brucellosis have been associated with exposure to infected domestic livestock. It is to be expected that dog infections derived from livestock will decrease as the eradication program nears completion.

Canine brucellosis caused by three well-known and recognized Brucella species is of relatively minor importance compared with infections by these organisms in farm animals. However, the organism commonly called Br. canis is of utmost concern to dog breeders. Since 1963, this organism has been associated with abortion and infertility in breeding kennels across the country (26). It has been isolated from blood or identified serologically in at least 35 states (27). An epizootic of canine abortion is occurring in this country and although there are no apparent breed susceptibility differences, Beagles are most commonly affected. The disease does not appear to pose a threat to the family dog (26).

Diagnosis of Br. canis infection is made clinically by isolation of the organism, or by serum agglutination tests (26). Serological results are specific, and no cross-reactions with Br. abortus antigen have been noted. Eradication of the organism from a kennel is best accomplished through test and removal methods. There is no immunizing agent and therapy has been ineffective (28). Moore and others have described a successful eradication procedure (29).

Studies on the characteristics of the organism of canine abortion by several investigators have disclosed that it closely resembles the genus Brucella and these authors have proposed that the name Brucella canis be adopted (27, 28, 30, 31).

References

1. MacDonald, G. F., Kelly, P. J., and Martin, W. J., Paradox of Brucellosis, Minn. Med., 50: 1469-1474, 1967.

2. Spink, W. W., Brucellosis Re-Examined, Minn. Med., 50: 1649-1651, November 1967.

3. Christianson, H. B., Pankey, George A., and Applewhite, Mary Lou, Ulcers of Skin Due to Brucella suis, Arch. Dermatology, 98: 175-176, 1968.

4. Halpern, S. E., and Wolf, S. G., An Unusual Case of Brucellosis, Jour. Amer. Med. Assoc. 204: 131-133, 1968.

5. Humphrey, G. L., Personal Communication, California State Dept. of Health, Berkeley, California, 1969.

6. Dreesen, D., Personal Communication, Ga. State Dept. Health, Atlanta, Ga., 1969.

7. Mathur, T. N., A Study of Human Brucellosis Based on Cultures Isolated From Man and Animals, Indian Jour. Med. Res., 56: 250-258, 1968.

8. Hill, W. A., Personal Communication, Baylor Univ. Col. Med., Houston, Tex., 1969.

9. Carmichael, L. E., Personal Communication, Veterinary Virus Research Institute, Cornell Univ., Ithaca, N.Y., 1968 and 1969.

10. Nicoletti, Paul, and Holmes, John, Attempts to Produce Cross-Reactions for Brucella in Cattle Treated With Hemorrhagic Septicemia Bacterins, Cornell Vet., 58: 421-424, 1968.

11. Harris, Harold J., Brucellosis, Paul B. Hoeber, Inc.: New York, 2nd Ed., p. 285, 1950.

12. Pollitzer, R., "Cholera," World Health Organization, Palais des Nations: Geneva, pp. 267-269, 1959.

13. Spink, Wesley W., The Nature of Brucellosis, The University of Minnesota Press: Minneapolis, pp. 63-64 and 194-195, 1956.

14. Ellis, D. J., Beck, C. C., and Ruhland, H. H., The Effect of Carbolic Acid on Brucella Titers in Cattle, Veterinary Medicine-Small Animal Clinician, 63: 372 and 375, 1968.

15. Vaccination Against Brucellosis, Vet. Rec., 81: 292-293, 1967.

16. Nagy, L. K., Hignett, P. G. and Ironside, C. J. T., Bovine Brucellosis: A Study of an Adult-Vaccinated, Brucella-infected Herd, The Vet. Record, 81: 140-144, 1967.

17. Schilf, E. A., Brucellosis Eradication Program, Its Present and Future Status, Jour. Dairy Sci., 51 (7): 1121-1125, 1968.

18. Nicoletti, Paul, and Fincher, M. G., The Recovery of Brucella abortus Strain 19-Like Organisms- A Case Report, Cornell Vet., 56: 167-171, 1966.

19. Wixom, H. G., and Vanderwagen, L. C., Calfhood Vaccination: Its Relation to Brucellosis Eradication, Proc. of the U. S. Livestock Sanitary Assoc., 69: 141-148, 1965.

20. Jones, Lois M., Montgomery, Virginia, and Wilson, J. B., Characteristics of Carbon Dioxide-Independent Cultures of Brucella abortus Isolated From Cattle Vaccinated With Strain 19, Jour. Infect. Dis., 115: 312-320, 1965.

21. Aldrick, Susan J., Typing of Brucella Strains from Australia and Papua-New Guinea Received by the Regional WHO Brucellosis Centre, Australian Vet. Jour. 44: 130-133, 1968.

22. Hutchins, D. R., and Lepherd, E. E., The Occurrence of Agglutinins to Brucella abortus in Horses, Australian Vet. Jour. 44: 323-325, 1968.

23. Morse, E. V., Canine Brucellosis - A Review of the Literature, Jour. Amer. Vet. Med. Assoc., 119: 304-308, 1951.

24. Clegg, F. G., and Rorrison, J. M., Brucella abortus Infection in the Dog: A Case of Polyarthritis, Res. Vet. Sci., 9: 183-185, 1968.

25. Nicoletti, D. L., Quinn, B. B., and Minor, P. W., Canine to Human Transmission of Brucellosis, N.Y. State Jour. Med., 67: 2886-2887, 1967.

26. Carmichael, L. E., Canine Brucellosis: Isolation, Diagnosis, Transmission, Proc. the U.S. Livestock Sanitary Assoc. (1968), pp. 517-527.

27. Carmichael, L. E., and Bruner, D. W., Characteristics of a Newly-Recognized Species of Brucella Responsible for Infectious Canine Abortions, The Cornell Vet. 58: 579-592, 1968.

28. Carmichael, L. E., and Kenney, R. M., Canine Abortion Caused by Brucella canis, Jour. Amer. Vet. Med. Assoc., 152: 605-616, 1968.

29. Moore, J. A., Gupta, B. N., and Conner, G. H., Eradication of Brucella canis Infection from a Dog Colony, Jour. Amer. Vet. Med. Assoc., 153: 523-527, September 1, 1968.

30. Jones, L. M., Zanardi, M., Leong, D., and Wilson, J. B., Toxonomic Position in the Genus Brucella of the Causative Agent of Canine Abortion, Jour. Bact., 95: 624-630, 1968.

31. Diaz, R., Jones, L. M., and Wilson, J. B., Antigenic Relationship of the Gram-negative Organism Causing Canine Abortion to Smooth and Rough Brucellae, Jour. Bact. 95: 618-624, 1968.

PROPOSED AND NEW FEDERAL REGULATIONS

Cattle Identification

On February 1, 1969, there was published in the Federal Register a Notice of Proposed Rule Making in which the U.S. Department of Agriculture proposed regulations requiring the identification of cattle 2 years of age and over--except steers and spayed heifers--that are moving to slaughter.

The intent of the proposal is to strengthen the surveillance over the brucellosis and tuberculosis programs by assisting the cattle industry to more rapidly eradicate these diseases. This identification--a Department-approved backtag or a registered brand--will provide more efficient procedures to rapidly locate and take corrective measures in herds found to be infected from tests and examinations made at time of slaughter.

This will also result in less herd testing on farms and ranches. A 60-day period for persons wishing to submit written data, views, or arguments concerning the proposal were provided.

Comments are being received by the Animal Health Division, and they will receive careful consideration before further action in this matter. The Division is striving to provide a workable program of identification which will result in increasing disease surveillance with a minimum of extra effort required in the livestock marketing industry.

Interstate Movement of Cattle

Regulations proposed December 18, 1969, affecting the interstate movement of cattle that could spread brucellosis, are to be published in the Federal Register when adopted.

The amended regulations are intended to provide better protection against introduction of brucellosis into Modified Certified areas from counties that have not attained this status. Counties and States qualify for Modified Certified status when less than 1 percent of the cattle and less than 5 percent of the herds in the area are affected with brucellosis.

The amended regulations will permit the use of the Market Cattle Testing "back tag" as a means of individual identification whenever shipping permits are required. Another change will permit calves under 6 months of age in an area not Modified Certified to move interstate if from a qualified herd.

Cattle originating in any herd may be moved interstate directly to a quarantined feedlot, or through approved markets to quarantined feedlots, when accompanied by a shipping permit. Steers and spayed heiferes over 6 months of age may be moved interstate without restrictions.

Cattle not known to be affected with brucellosis in Modified Certified areas, or from qualified herds in areas not Modified Certified, may be moved interstate for immediate slaughter when accompanied by a waybill or owner's statement.

The amended interstate regulations, if adopted, are to be effective on August 1, 1969.

Upper Age Limits Lowered For Calves Vaccinated Against Brucellosis

The upper age limits for calves vaccinated for brucellosis will be reduced under amendments to be published in the Federal Register. The amendments are to be effective on publication.

This amendment was approved by the Animal Health Division of USDA's Agricultural Research Service. Dairy heifers may now be vaccinated at 3 to 8 months (90 to 239 days) of age and beef heifers at 3 to 10 months (90 to 299 days) of age.

Formerly, the age limits for dairy heifers had been 3 through 8 months and beef heifers 3 through 11 months of age. Reducing the upper age limits at which calves may be vaccinated for brucellosis decreases the number of animals that react when brucellosis tested.

The amendments brings the Code of Federal Regulations into conformity with the Uniform Methods and Rules for brucellosis eradication. The change was recommended by the United States Animal Health Association and approved by ARS's Animal Health Division.

Carcass Identification

On March 28, 1969, the U.S. Department of Agriculture proposed a procedure for implementing a system to better identify cattle and parts of cattle carcasses until after-slaughter inspection is completed.

The system provides for retaining ear tags, back tags, and all other identifying devices put on livestock, so they can be related to the carcass after the animal is slaughtered. The amendment to the meat inspection regulations that provides for this system was published in the Federal Register October 18, 1968.

USDA's Consumer and Marketing Service said that this proposed amendment outlines the procedure for carrying out this system for cattle. The procedure provides for a plant employee removing identifying tags, placing them in a plastic bag attached to the carcass, or using another acceptable method for retaining the tags, and presenting them to the C&MS inspector as he performs his duties. The plastic bags to be used will be furnished by USDA.

This system will give inspectors all available information about an animal, to be used along with before- and after-slaughter inspection findings to determine the wholesomeness of meat from that animal. It will aid inspectors in detecting disease and biological residue problems and spotting animals that come from locations known to have these problems.

Text of the proposal will be published in the Federal Register March 28, 1969.

REPORT OF UNITED STATES ANIMAL HEALTH ASSOCIATION COMMITTEE ON BRUCELLOSIS ERADICATION COOPERATIVE STATE-FEDERAL PROGRAM[1]

By H. G. Wixom,[2] Chairman

Your Brucellosis Committee met in open session on Monday to give opportunity for livestock and regulatory officials and other interested parties to make their recommendations pertaining to the national brucellosis eradication program and to explain problems encountered in the program. This open session was well attended. Keen interest still exists in the national brucellosis eradication program, and there are still problems to overcome. In spite of certain obstacles encountered during the past year, your committee reaffirms that the national goal of eradication by 1975 is still attainable if the knowledge concerning the disease and the proved procedures are applied to this national effort.

There are currently 14 States and the Virgin Islands that are Certified Brucellosis-Free areas as compared with 10 States in 1967. In addition there are 28 States that are Modified Certified Brucellosis areas. Now there are 94 percent of the counties of the United States that are either Modified Certified or Certified-Free areas as compared with 92 percent 1 year ago. Approximately 37 percent of these counties have achieved the higher rating as compared with 28.4 percent this time last year. Testing is being conducted in all but 18 counties of the Nation. This is a gain of 88 counties. Thus brucellosis eradication has been extended to 99.4 percent of the counties of the United States.

Interstate Movement of Cattle

The committee, after serious consideration, expresses concern that steps have not been taken by the United States Department of Agriculture to provide the livestock industry with protection from brucellosis infected and exposed cattle to which they are entitled. We find that 99.4 percent of the counties are moving ahead to achieve eradication, yet the industry in these counties are still exposed to the probability of reinfection from the remaining 0.6 of 1 percent of the areas. The industry in these remaining areas are making little or no effort to reduce the high incidence of brucellosis known to exist. The committee reaffirms its recommendation that effective January 1, 1969, all cattle moving interstate originate from Modified Certified Brucellosis Areas, Certified Bovine Brucellosis-Free Areas, or from herds known not to be affected with brucellosis. All cattle from quarantined herds or herds of unknown brucellosis status may move only for immediate slaughter or to quarantined feed lots.

The committee further recommends that the following definition of a quarantined feed lot be adopted and incorporated as a part of the Uniform Methods and Rules and the Federal Interstate Regulations. Definition: A quarantined feedlot shall be a confined area under the direct supervision and control of the State Livestock Official who shall establish procedures for accounting of all animals entering or leaving such quarantined feedlot. The quarantined feedlot shall be

[1]Report presented at the 72d Annual Meeting, October 7-11, 1968, New Orleans, La.
[2]Chief, Division of Animal Industry, California Department of Agriculture, Sacramento, Calif.

maintained for finish feeding of animals in drylot with no provision for pasturing or grazing. All animals leaving such feedlot must move only for immediate slaughter in accordance with established procedures for handling quarantined animals.

The committee recommends that a copy of this recommendation pertaining to interstate movement be forwarded immediately to the Secretary of Agriculture requesting that no revision of Part 78, Title 9, Code of Federal Regulations, be published before this recommendation has been considered.

Age of Vaccination

As eradication of brucellosis is approached, the problems of persistent titers because of vaccination becomes more evident. Calves vacinnated at the upper ages are more apt to show persistent titers. In harmony with the national advancement in the program, more emphasis needs to be given to vaccinating at the lower age levels. The committee recommends that the age of vaccination be established at 3 to 8 months (90 to 239 days) of age for the dairy breeds and 3 to 10 months (90 to 299 days) for the beef breeds. Cattle owners are urged to arrange to have their animals vaccinated as close as possible to the minimum age.

Testing of Official Vaccinates

Reconsideration was given to when official vaccinates should be tested to assure the continued progress of the program. The committee reaffirms their recommendation as published in the 1967 Uniform Methods and Rules and urges its incorporation in the Uniform Methods and Rules and the Federal Interstate Regulations. This recommendation is:

Beginning January 1, 1970, officially vaccinated heifers of the beef breeds be tested at 24 months of age, and those of the dairy breeds at 20 months of age.

Uniform Methods and Rules

As the free areas have increased a problem has been noted in marketing brucellosis reactors. The committee recommends that the Uniform Methods and Rules be amended to permit the sale of reactors through markets in Certified-Free areas in accordance with established procedures for State-Federal approved markets.

In the certification of areas the committee recommends that Brucellosis Ring Tests be conducted at not less than three times per year. Qualifying tests should be conducted at approximately equal intervals. Only two States remain that are conducting the Brucellosis Ring Test on a semiannual basis.

Modified Certified Brucellosis Areas

To assure that proper precautions are provided to the various states accepting cattle from the Modified Certified Brucellosis Areas without further test, the committee recommends the Uniform Methods and Rules and the Federal Interstate Regulations be amended to provide that continuous brucellosis programs are conducted to locate and eliminate infected cattle within any area which is declared Modified Certified.

Exemptions for Calves

The committee finds that the exemptions for the movement of calves are not consistent in the Federal Interstate Regulations and the Uniform Methods and Rules. We recommend that the exemption be the same, that is, 6 months of age.

Animal Identification

The committee again urges the adoption of regulations by the Federal Government requiring identification of animals moved interstate. Such regulations were discussed and will be published in the Federal Register in the near future.

Swine Brucellosis

Some progress has been made during the year in expanding the market swine testing program. However, the progress of establishing Validated Brucellosis-Free States has not progressed as rapidly as hoped. The Committee recommends an alternate method of Validating States and encourages the States to implement the recommendations.

Our recommendations are:

1. Develop and implement a swine market testing program.

2. Support the swine identification program as an integral part of programs for eradicating swine diseases.

3. The various States, in cooperation with the United States Department of Agriculture, that have conducted market swine testing programs and intensified swine brucellosis eradication programs are to be commended. We recommend that the States implement and enforce regulations to prohibit the interstate movement of breeding swine without official test unless they originate in Validated Brucellosis-Free herds or areas.

Provisions should be made for Validating States as swine brucellosis free when:

1. All herds selling breeding stock are tested and declared Validated.

2. Sows, boars, and stags are tested at slaughter.

3. Reactors are found, the herd of origin is Validated or sent to slaughter.

States complying with these provisions for a 1-year period should be declared Validated.

Research

In reviewing the brucellosis eradication program the livestock industry requested that additional research be undertaken to develop information that would expedite eradication of brucellosis. Therefore, we urgently recommend that the United States Department of Agriculture, State agencies, and private industry expand research to develop improved immunizing products and diagnostic procedures immediately; furthermore, that adequate funds be provided to implement this research.

I wish to thank the members of this committee for their interest and hard work. They spent long hours in studying the problems of the brucellosis program. It has been a real pleasure for me to work with them.

MEMBERS OF THE U.S.A.H.A. BRUCELLOSIS COMMITTEE: H. G. Wixom, Chairman, Sacramento, Calif.; J. W. Ralph Bishop, Tipton, Ind.; G. E. Burch, Delmar, N.Y.; George B. Estes, Richmond, Va.; Dean E. Flagg, Bismark, N. Dak.; A. E. Janawicz, Montpelier, Vt.; W. D. Knox, Ft. Atkinson, Wis.; Robert I. Laramore, Gillette, Wyo.; C. A. Manthei, Ames, Iowa; R. J. McClenaghan, Ottawa, Ontario, Canada; S. H. McNutt, Madison, Wis.; J. O. Pearce, Jr., Okeechobee, Fla.; E. A. Schilf, Hyattsville, Md.; Jean V. Smith, Hartford, Conn.; William C. Tobin, Denver, Colo.; A. O. Wilson, Hysham, Montana; Fred Phillips, Keating, Oreg.; Joe B. Finley, Jr., Encinal, Tex.

SITUATION REPORT ON THE FLORIDA BRUCELLOSIS PROGRAM

By E. A. Schilf [1]

The Brucellosis Eradication Program in Florida came to an abrupt halt in September as the result of a circuit court decision which declared unconstitutional some of the laws and regulations under which the cooperative program in Florida was conducted. The program was resumed in November following resolutions from the Florida Cattlemen's Association Board of Directors and recommendations of the Animal Industry Technical Committee. On the advice of the Animal Industry Technical Committee, Commissioner of Agriculture, Doyle Connor, placed St. Johns, Polk, Seminole, and Glades Counties under the cooperative State-Federal Program. Hardy County had previously petitioned to inaugurate testing; however, a temporary injunction by one cattleman in the county prohibited the State from starting program work.

The case is currently before the State Supreme Court. At this time a decision has not been rendered. The program in Florida, however, is moving forward quite satisfactorily. All indications are that the program currently being conducted in Florida is an excellent program. The State has a regulation requiring identification and blood sampling of slaughter cattle. The State is effectively controlling movements of cattle from noncertified areas into certified areas. Infected herds are quarantined.

It is anticipated there may be some slowdown in the testing program if a decision is not rendered by the Supreme Court in the near future. There will be no effort made to take action requiring the testing of any herds in noncertified areas, and any cattleman not willing to test will be passed by until the Supreme Court has ruled on the case.

Several counties have been certified since the circuit court decision, and it is anticipated that there will be considerable progress made in the eradication of brucellosis from Florida while waiting for the Supreme Court decision.

---

[1] Senior Staff Veterinarian, Cattle Diseases, Animal Health Division, Agricultural Research Service, U.S. Department of Agriculture, Hyattsville, Md.

REPORT OF NATIONAL BRUCELLOSIS COMMITTEE TO LIVESTOCK CONSERVATION, INC.

By J. W. Ralph Bishop,[1] Chairman

The annual meeting of the National Brucellosis Committee convened at 9 a.m. in the Iowa Room, with over 50 participants in attendance.

The morning session was devoted to swine brucellosis. J. B. Taylor, Alabama, John Atwell, Maryland, and Paul Doby, Illinois, reviewed the Market Swine Testing programs in their respective States. These programs involved the identification of sows and boars in market channels and the blood testing of these animals at the market or in slaughter plants. Over 50,000 animals were tested in the three States, with a total of 428 brucellosis reactors traced to 231 herds. In some of these programs it has not been possible to get tests on all animals identified because they were slaughtered in other States. Some animals, though identified, could not be traced to a herd of origin.

Don Pietz, National Animal Disease Laboratory, Ames, Iowa, reported on the Market Swine Testing pilot project at the Farmbest Plant at Denison, Iowa. Over 18,000 head of sows were blood sampled at the plant and tested at the NADL. These tests found only 30 reactors traced to nine herds or lots.

These market swine testing projects point out the need for a workable swine identification program that can be used in the eradication of swine brucellosis. Herd by herd, down-the road testing of swine is not economically feasible; therefore, a market swine testing program must be developed that will make it possible for industry and regulatory officials to locate the farm of origin when reactors are found at the market or when blood sampled at slaughter.

Gerald Fichtner, Animal Health Division, reported on the national progress in eradicating swine brucellosis. As of January 1969, over 2,900 herds in 45 States and Puerto Rico have been Validated Brucellosis-Free, an increase of more than 700 herds since January 1966. In addition, 166 counties in the United States and the Virgin Islands have achieved Validated Brucellosis-Free area status, including all counties in Vermont, Utah, Nevada, and the Virgin Islands.

B. L. Deyoe, NADL, reported on diagnostic tests for swine brucellosis and compared the relative merits of several tests. For overall use, the card test or acidified plate antigen tests are far more accurate for identifying infected swine than the standard plate agglutination test.

C. A. Manthei, NADL, reviewed published literature and identified the things we know and do not know about killed Brucella abortus, Strain 45/20 because of the interest of some segments of the cattle industry in the use of this vaccine to control bovine brucellosis.

Richard Parker, National Communicable Disease Center, Atlanta, Ga., reported on the number of human cases of brucellosis in 1968. There were 231 cases reported compared with 258 cases in 1967. Of the 231 cases reported, 187 were checked to determine the source of the disease. Of these 187, 81 cases point to swine as the source of infection; 25 to cattle, and 21 to swine and cattle.

---

[1] Owner, Bishop's Hampshires, Tipton, Ind.

In the afternoon session devoted to brucellosis in cattle, Harold King, Animal Health Division, reported that 95 percent of the counties in the United States have achieved Modified-Certified brucellosis area status. Our rate of progress in qualifying the remaining 5 percent of the counties must be accelerated. There are still 158 counties in seven States in which sufficient work has not been completed to qualify for Modified Certified brucellosis status, including 10 counties in two States in which area testing has not been started.

At the end of 1968, there were 1,198, or 38 percent, of the counties in the United States, Puerto Rico, and the Virgin Islands, that were Certified Brucellosis-Free. This is a 27-percent increase over 1967 and a net gain of 256 counties. Although this represents a significant gain percentage-wise, it is evident that a great deal of work still must be accomplished if the remaining 62 percent of the counties are to become Certified Brucellosis-Free in the next 7 years.

Proposed regulations on the identification of cattle moving interstate was discussed by F. W. Hansen, Animal Health Division. All cattle 2 years of age or over, except steers and spayed heifers, would be identified with back tags or brands in order to trace animals back to their State and herd of origin. This proposal would supplement the requirements of the 1968 Wholesome Meat Act in maintaining the identification of cattle carcasses through slaughter.

H. G. Wixom, California, reviewed the recommendations of the Brucellosis Committee of the United States Animal Health Association (formerly USLSA). One recommendation was the strengthening of the interstate regulations for movements of cattle from areas that are not Modified-Certified into areas that have achieved Modified-Certified area status. This committee also recommended that the ages for vaccinating calves be changed to 3 to 8 months (90 to 239 days) for dairy heifers, and 3 to 10 months (90 to 299 days) for beef heifers.

E. A. Schilf, Animal Health Division, reported on the brucellosis eradication program in Florida. A court has ruled that the Florida plan for paying indemnity for brucellosis reactors was unconstitutional. The court believes that indemnity cases be determined and settled by the court. A ruling by the Florida Supreme Court on this case has not been determined at this time.

Chairman Forest Lee, of the Nomination Committee, submitted the following nominees as Directors for 1972: Russell Ives, S. L. Hendrix, H. G. Wixom, Charles Dancer, John W. Black, W. E. Smith, and Al Keating. For officers in 1969, Lee submitted the following: Chairman, J. W. Ralph Bishop; Vice-Chairman, J. B. Finley; Secretary, Paul Zillman, and Assistant-Secretary, Howard S. Obenchain. The Secretary was directed to cast a unanimous ballot for all nominees of the Board of Directors and Officers.

It was recommended by Richard Parker, that the Chairman of the National Brucellosis Committee appoint a subcommittee to determine if the National Brucellosis Committee continue to be affiliated with LCI, and if so, to dissolve the incorporation status of the NBC.

That the subcommittee report their decision to the executive committee of Livestock Conservation, Inc. at their April meeting in Chicago. The sub-committee members are Bill Knox, E. A. Schilf and C. A. Manthei.

YOUR STATE AND FEDERAL ANIMAL HEALTH OFFICIALS

If you desire more detailed information on the brucellosis eradication program in your State, please contact the Federal Veterinarian in Charge, Animal Health Division, or the State Official in Charge of the animal disease program.

State or Territory	Federal Veterinarian in Charge	State Official
Alabama	A. G. Pass P.O. Box 1749 421 South McDonough Street Montgomery, Ala. 36103	J. G. Milligan State Veterinarian Department of Agriculture and Industries P.O. Box 220 Montgomery, Ala. 36101
Alaska	H. D. White Room 28 Federal Building Anchorage, Alaska 99501	F. S. Honsinger State Veterinarian P.O. Box 3473 Juneau, Alaska 99801
Arizona	Ted Rea P.O. Box 7397 4004 North Seventh Street Phoenix, Ariz. 85011	L. N. Butler State Veterinarian 1521 W. Jefferson Street Phoenix, Ariz. 85007
Arkansas	Paul Becton P.O. Box 3548 Room 5506 Federal Building Little Rock, Ark. 72203	J. B. Roberts Assistant Director Arkansas Livestock and Poultry Commission 2915 South Pine Street Little Rock, Ark. 72204
California	J. H. Wommack 650 Capitol Avenue Room 8506 Sacramento, Calif. 95814	H. G. Wixom Assistant Director Animal Industry Department of Agriculture 1220 N Street Sacramento, Calif. 95814
Colorado	R. W. Gerding 13037 Federal Building U.S. Courthouse 1961 Stout Street Denver, Colo. 80202	William C. Tobin State Veterinarian Room 420 1525 Sherman Street Denver, Colo. 80203

State or Territory	Federal Veterinarian in Charge	State Official
Connecticut	W. C. Ferrall Room 260 State Office Building Hartford, Conn. 06115	Jean V. Smith State Veterinarian Department of Agriculture & Natural Resources State Office Building Hartford, Conn. 06115
Delaware	W. L. Rehkemper State Board of Agriculture Building P.O. Drawer D Dover, Delaware 19901	E. L. Symington State Veterinarian State Board of Agriculture Department of Poultry & Animal Health Dover, Delaware 19901
Florida	J. B. Healy Box No. 35028 200 W. Bay Street 480 New Federal Building Jacksonville, Florida 32202	C. L. Campbell State Veterinarian--Director Division of Animal Industry Florida Dept. of Agriculture P. O. Box 1509 Tallahassee, Florida 32302
Georgia	C. J. Mikel Title Building Room 1030 30 Pryor Street, S.W. Atlanta, Georgia 30303	J. F. Andrews State Veterinarian Agriculture Building Capitol Square Atlanta, Georgia 30334
Hawaii	E. G. Ongert 1481 South King Street Room 436 Honolulu, Hawaii 96814	E. H. Willers State Veterinarian P.O. Box 5425 Pawaa Station Honolulu, Hawaii 96814
Idaho	A. P. Schneider, Director State-Federal Livestock Regulatory Program 716 Idaho Street Boise, Idaho 83702	A. P. Schneider (Same)
Illinois	M. L. Johnson P.O. Box 2149 100½ East Washington Street Springfield, Illinois 62701	P. B. Doby, Superintendent Division of Livestock & Poultry Inspection Emerson Building State Fair Grounds Springfield, Illinois 62706
Indiana	L. R. Barnes 311 West Washington Street Room 210 Indianapolis, Indiana 46204	David L. Smith State Veterinarian 801 State Office Building 100 N. Square Avenue Indianapolis, Indiana 46204

State or Territory	Federal Veterinarian in Charge	State Official
Iowa	G. E. Blake Room 877 Federal Building 210 Walnut Street Des Moines, Iowa 50309	E. A. Butler, Chief Division of Animal Industry State House Des Moines, Iowa 50319
Kansas	D. O. Manley P.O. Box 1518 536 Jefferson Street Topeka, Kansas 66601	A. G. Pickett Livestock Sanitary Commissioner State Office Building Topeka, Kansas 66612
Kentucky	L. T. Fisher P.O. Box 399 105½ St. Clair Street Frankfort, Kentucky 40601	L. G. Northington State Veterinarian Division of Livestock Sanitation Department of Agriculture New Capitol Annex Frankfort, Kentucky 40601
Louisiana	F. E. Henderson P.O. Box 1391 New Post Office Building 750 Florida Boulevard Baton Rouge, Louisiana 70821	F. B. Wheeler State Veterinarian P.O. Box 4003 Capitol Station Baton Rouge, Louisiana 70804
Maine	C. W. Wilder U.S. Post Office & Federal Building 40 Western Avenue Augusta, Maine 04330	F. G. Buzzell, Director Division of Animal Industry Department of Agriculture State Office Building Augusta, Maine 04330
Maryland	L. D. Cherry Room 510 Hartwick Building 4321 Hartwick Road College Park, Maryland 20740	T. A. Ladson, Director Livestock Sanitary Service Symons Hall University of Maryland College Park, Maryland 20742
Massachusetts	J. A. Zimmerman 802 Customhouse Building Boston, Massachusetts 02109	E. M. Dwyer, Director Division of Animal Health State Office Building 100 Cambridge Street Boston, Massachusetts 02202
Michigan	C. L. Hendee Sixth Floor Lewis Cass Building Lansing, Michigan 48913	J. F. Quinn State Veterinarian Livestock Disease Control Division Department of Agriculture Lewis Cass Building Lansing, Michigan 48913

State or Territory	Federal Veterinarian in Charge	State Official
Minnesota	D. F. Werring 555 Wabasha Street St. Paul, Minnesota 55102	J. G. Flint Secretary & Executive Officer State Livestock Sanitary Board 555 Wabasha Street St. Paul, Minnesota 55102
Mississippi	L. J. Pate P.O. Box 1120 400 Milner Building Corner Lamar & Pearl Streets Jackson, Mississippi 39205	V. D. Chadwick State Veterinarian P.O. Box 4356 Jackson, Mississippi 39216
Missouri	L. F. Van Gorder P.O. Box 1027 203 - 205 Post Office Bldg. Jefferson City, Missouri 65101	G. C. Stiles State Veterinarian Department of Agriculture P.O. Box 630 Jefferson Bldg., 13th Floor Jefferson City, Missouri 65102
Montana	J. H. Slack 200 Steamboat Block 616 Helena Avenue Helena, Montana 59601	J. W. Safford State Veterinarian Livestock Sanitary Board Helena, Montana 59601
Nebraska	E. H. Nordstrom P.O. Box 1866 303 Farmers Mutual Insurance Building 1220 J. Street Lincoln, Nebraska 68501	S. H. Flora State Veterinarian State Capitol Building Room 1124-1126 Lincoln, Nebraska 68501
Nevada	C. R. Watson 1395 Haskell Street Suite B Reno, Nevada 89502	J. L. O'Hara, Director Division of Animal Industry P.O. Box 1209 Reno, Nevada 89504
New Hampshire	C. W. Wilder U.S. Post Office & Federal Building 40 Western Avenue Augusta, Maine 04330	C. B. Dearborn, Jr. State Veterinarian Division of Animal Industry 4 Park Street Concord, New Hampshire 03301
New Jersey	R. L. Alkire P.O. Box 938 Health & Agriculture Bldg. John Fitch Plaza Trenton, New Jersey 08605	E. L. Brower, Director Division of Animal Industry Department of Agriculture P.O. Box 1888 Trenton, New Jersey 08625

State or Territory	Federal Veterinarian in Charge	State Official
New Mexico	R. L. Pyles P.O. Box 464 4010 New Federal Office Bldg. 517 Gold Avenue Albuquerque, New Mexico 87103	J. E. Kleck State Veterinarian Cattle Sanitary Board of New Mexico P.O. Box 1296 Albuquerque, New Mexico 87103
New York	Dale Suplee Building 8 State Campus Albany, New York 12226	G. S. Kaley, Director Division of Animal Industry Building 8 State Campus Albany, New York 12226
North Carolina	W. W. Harkins P.O. Box 2656 320 Agricultural Building Raleigh, North Carolina 27603	T. F. Zweigart State Veterinarian Department of Agriculture P.O. Box 670 Raleigh, North Carolina 27602
North Dakota	G. W. Spangler P.O. Box 639 Room 222, Federal Building 220 East Rosser Avenue Bismarck, North Dakota 58502	Dean Flagg Executive Officer & State Vet. Livestock Sanitary Board State Capitol Building Bismarck, North Dakota 58501
Ohio	P. H. Kramer Room 448 Old Post Office Building Columbus, Ohio 43215	H. E. Goldstein, Chief Animal Industry Department of Agriculture Ohio Departments Building Columbus, Ohio 43215
Oklahoma	L. N. Miller, Jr. 1421 Federal Building 200 Northwest 4 Oklahoma City, Oklahoma 73102	J. H. Brashear State Veterinarian State Board of Agriculture 122 State Capitol Building Oklahoma City, Oklahoma 73105
Oregon	O. J. Halverson 494 State Street Room 203 Salem, Oregon 97301	G. B. Rea Chief Veterinary Division Department of Agriculture Salem, Oregon 97310
Pennsylvania	G. T. Mainwaring P.O. Box 2065 2301 North Cameron Street Harrisburg, Pennsylvania 17110	J. C. Shook, Director Bureau of Animal Industry Department of Agriculture 408 Agriculture Office Bldg. 2301 North Cameron Street Harrisburg, Pennsylvania 17110

State or Territory	Federal Veterinarian in Charge	State Official
Rhode Island	J. A. Zimmerman 802 Customhouse Building Boston, Massachusetts 02109	T. J. Grennan, Jr. State Veterinarian State Department of Health Southern Field Office 2843 South County Trail East Greenwich, R.I. 02818
South Carolina	C. E. Boyd, Director State-Federal Livestock Disease Eradication Program P.O. Box 1771 Columbia, South Carolina 29202	C. E. Boyd (Same)
South Dakota	E. M. Joneschild P.O. Box 758 Room 317 New U.S. Courthouse & Post Office Pierre, South Dakota 57501	M. D. Mitchell Executive Secretary & State Vet. Livestock Sanitary Board State Office Building Pierre, South Dakota 57501
Tennessee	W. W. Bird P.O. Box 510 548 U.S. Courthouse Nashville, Tennessee 37202	C. E. Kord State Veterinarian Division of Animal Industry P.O. Box 9039 Melrose Station Nashville, Tennessee 37204
Texas	E. S. Cox Third Floor Western Republic Life Bldg. Austin, Texas 78701	J. B. Henderson Executive Director Animal Health Commission 1020 New State Office Bldg. Austin, Texas 78701
Utah	J. E. Rasmussen P.O. Box 11429 5237 Federal Building 125 South State Street Salt Lake City, Utah 84111	F. J. Schoenfeld State Veterinarian Department of Agriculture Room 412-A, State Capitol Bldg. Salt Lake City, Utah 84114
Vermont	R. M. Scott State Agricultural Building Montpelier, Vermont 05602	A. E. Janewicz State Veterinarian State Agricultural Building Montpelier, Vermont 05602
Virginia	E. C. Roukema Room 204 1444 East Main Street Richmond, Virginia 23219	W. L. Bendix State Veterinarian Division of Animal Health and Dairies 1444 East Main Street Richmond, Virginia 23219

State or Territory	Federal Veterinarian in Charge	State Official
Washington	J. K. Atwell 205 Union Avenue Building 120 E. Union Avenue Olympia, Washington 98501	D. A. Spangler Division of Animal Industry Department of Agriculture Post Office Box 128 Olympia, Washington 98501
West Virginia	L. G. Berg 3404 Federal Office Bldg. 500 Quarrier Street Charleston, West Virginia 25301	J. E. Christy State Veterinarian Room E-100 Capitol Building Charleston, West Virginia 25305
Wisconsin	A. A. Erdmann Chief Veterinarian State-Federal Cooperative Program Hill Farms State Office Bldg. Madison, Wisconsin 53702	A. A. Erdmann (Same)
Wyoming	W. M. Reynolds P.O. Box 825 Room 8007 2120 Capitol Avenue Post Office & Courthouse Cheyenne, Wyoming 82001	N. R. Swanson Joseph C. O'Mahoney Federal Ctr. 2120 Capitol Avenue Cheyenne, Wyoming 82001
Puerto Rico	O. L. Kelsey GPO Box 3488 San Juan, Puerto Rico 00936	Luis Rivera-Brenes Secretary of Agriculture Commonwealth of Puerto Rico Department of Agriculture San Juan, Puerto Rico 00936

★ U. S. GOVERNMENT PRINTING OFFICE : 1969—343-498/ARS-101

NATIONAL AGRICULTURAL LIBRARY
1022830323